National Aeronautics and Space Administration

1999 Accountability Report

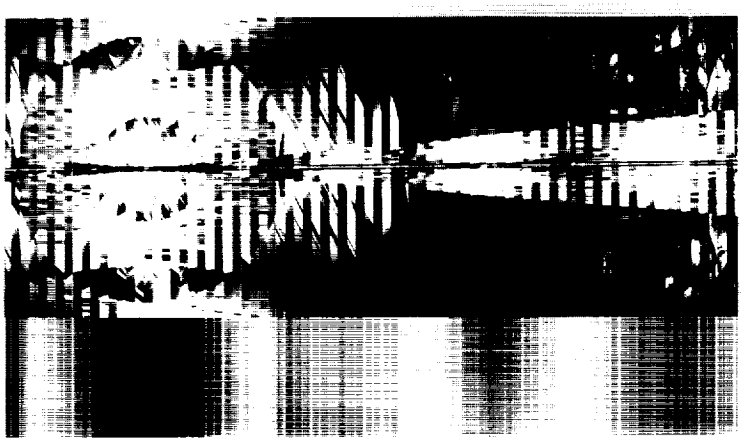
. . . For I dipp'd into the future,

far as human eye could see,

saw the Vision of the world,

and all the wonder that would be; . . .

—Alfred Lord Tennyson



About the cover: "Imaging to the Edge of Space and Time," acrylic painting by James L. Cunningham. The artist has depicted the genesis of the universe, expanding from the instant of the Big Bang to normal space/time we observe today.

For more than 30 years, the NASA Art Program has documented America's accomplishments in aeronautics and space. More than 200 artists have generously contributed their time and talent to record their impressions of the U.S. aerospace program in painting, drawings, and other media. More than 2,000 works have been donated to the National Air and Space Museum; many of the NASA-owned pieces are displayed at galleries, museums, and NASA Centers around the country, and samples are featured in this report.

Statement of the Administrator

Daniel S. Goldin
Administrator

The future exploration of the space frontier can make the third millennium a magnificent time of achievement for humankind. We are delivering our programs while continuing to make safety our number-one priority. Our results come from the hard work of the NASA team—employees, contractors, academic researchers, industry, government, and international partners—and the continued support of the President, Congress, and the public.

Our programmatic accomplishments include new understandings in four strategic areas:

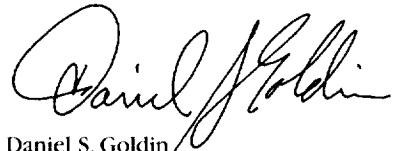
- The Space Science Enterprise studies the origin and operations of the universe. The Hubble Telescope has illuminated the universe's rate of expansion, which is essential in determining the age and size of the universe. The first optical images of a gamma ray burst were captured. The Mars Global Surveyor provided the first global 3-D map of Mars. The Chandra X-ray Observatory, designed to observe x-rays from high-energy regions of the universe, began sending exciting images back to Earth.
- The Earth Science Enterprise continues to provide invaluable satellite and aircraft observations that are unraveling the mysteries of Earth system processes. We provided dramatic images and data on the waxing and waning of El Niño and La Niña, enabling seasonal climate prediction. The Enterprise produced the first satellite-derived assessments of global forest cover with the launch of Landsat 7. Researchers determined thinning and thickening rates for the Greenland Ice Sheet and provided the first radar-detailed mosaic of Antarctica.
- The Human Exploration and Development of Space Enterprise successfully completed the first International Space Station assembly and logistics mission, mating the Zarya control module and Unity Node and delivering supplies and equipment, which will be needed to operate and live on the Station. Chandra, the third Great Observatory and the heaviest payload ever launched, was safely deployed by the STS-93 crew, led by the Shuttle program's first female Commander, Eileen Collins. John Glenn made his historic return to space, studying the effects of aging and weightlessness.
- The Aero-Space Technology Enterprise, with industry partners, has developed new technology to allow planes to land safely in bad weather on parallel runways spaced as closely as 2,500 feet apart. NASA and its general aviation partners also demonstrated a low-emission combustor that resulted in reductions in oxides of nitrogen and carbon monoxide emission levels. A test version of the X-34 rocket plane made its first flight as part of a certification process—the prototype will test new technologies and methods needed to develop low-cost reusable space vehicles.

As an institution, NASA has reorganized its Centers around areas of excellence, performance-based contracting, and privatization and met the severe challenges of reducing budgets on an annual basis.

For NASA, 1999 encompassed a celebration of the Agency's past, the exciting accomplishment of our current endeavors, and our visions of the future. As the 20th century closes, history will record that in the 1960's humankind opened the vast frontier beyond Earth's atmosphere. The Apollo program blazed a trail of the pioneering spirit of exploration, and this year we celebrated the 30th anniversary of our first steps on the Moon.

In coming months, we will be sending the first crew to establish permanent habitation of the International Space Station—a long-duration space laboratory and the largest structure ever built in space. The Station, by its permanence, allows many uses of space in conducting experiments that need more time than the 14 days a Shuttle mission could provide. It is necessary as a "spaceport" for more advanced space missions by humans in deep space and as a launch platform to embark on interplanetary flights.

Our vision of the 21st century is one of a future world with nations and industry sharing responsibilities, opportunities, and challenges through peaceful interaction in civil space endeavors. Our exploration of the unknown will lead to discoveries of new worlds and generate new knowledge that stirs the soul, nourishes the mind, and enriches our lives.



Daniel S. Goldin
Administrator

Arnold G. Holz
Chief Financial Officer

Statement of the Chief Financial Officer

This Accountability Report consolidates reports required by various statutes and summarizes NASA's program accomplishments and its stewardship over budget and financial resources. It is a culmination of NASA's management process, which begins with mission definition and program planning, continues with the formulation and justification of budgets for the President and Congress, and ends with the resulting scientific and engineering program accomplishments. The report covers activities from October 1, 1998, through September 30, 1999, with a discussion of some subsequent events.

Program accomplishments included the deployment and operation of the Chandra X-ray Observatory, the delivery of supplies and equipment needed to live and operate on the International Space Station, and the development of the first global 3-D map of Mars. Achievements are highlighted in the Statement of the Administrator and summarized in the performance section of this report. Accomplishments such as these continue despite declining budgetary resources. Agency budgets have fallen from a high of 4 percent of the Federal budget during the 1960's to less than 1 percent of the current Federal budget. This budgetary challenge has been met by reorienting programs, eliminating low-priority efforts, reducing support contracts and civil service staffing, and reforming procurement.

Internal controls have been improved and budget and financial management streamlined. In that regard, Agency financial management systems substantially comply with the Federal Financial Management Improvement Act.

Financial statements were prepared in accordance with Federal generally accepted accounting principles, and reporting instructions specified by the Office of Management and Budget.

NASA has received the highest possible financial statement audit ratings (unqualified opinions) on its financial statements for six consecutive years. In addition, the Agency was honored with the first-ever "Certificate of Excellence in Accountability Reporting" by the Association of Government Accountants (AGA) in recognition of its exemplary performance in the preparation, issuance, and timeliness of its 1998 Accountability Report. The AGA award reflects well on the entire NASA team.

As the Agency continues to advance the technologies of space, we will continue to lead innovations and improvements in the reporting of the accountability of the Federal Government. The preparation of this report required the teamwork and dedicated efforts of NASA's staff and its auditors. We appreciate their dedication and professionalism. As we combine cutting-edge technologies and business management, the space program will be a vital engine of the economy as we move into the new millennium.

Arnold G. Holz
Chief Financial Officer

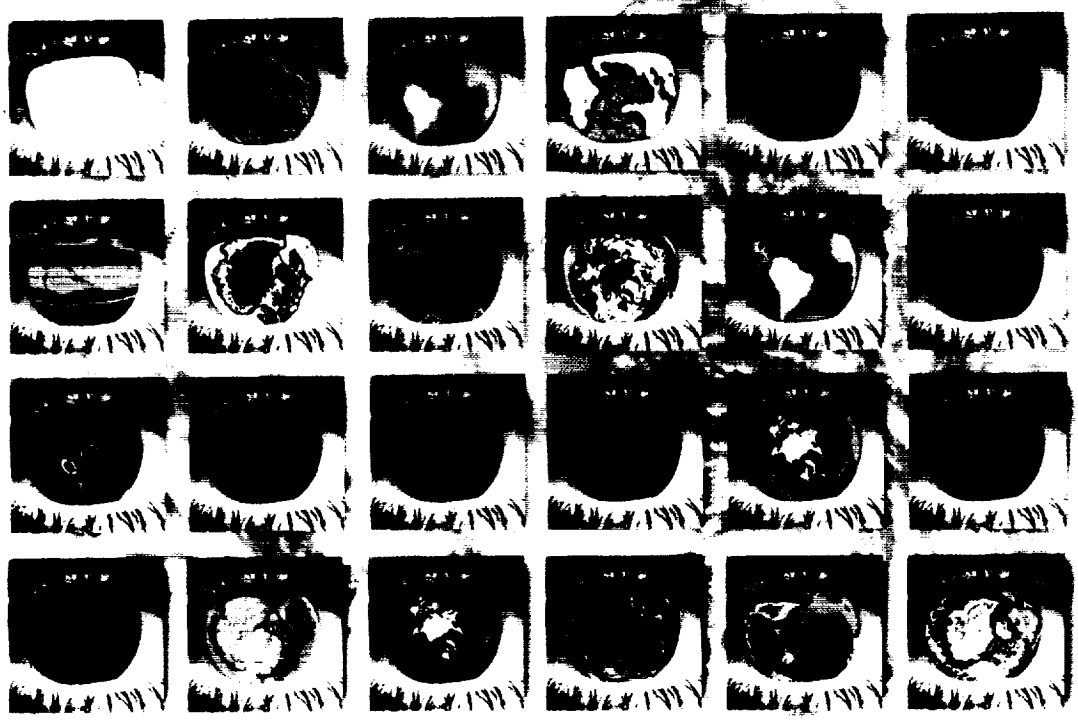
Contents

1999 Accountability Report

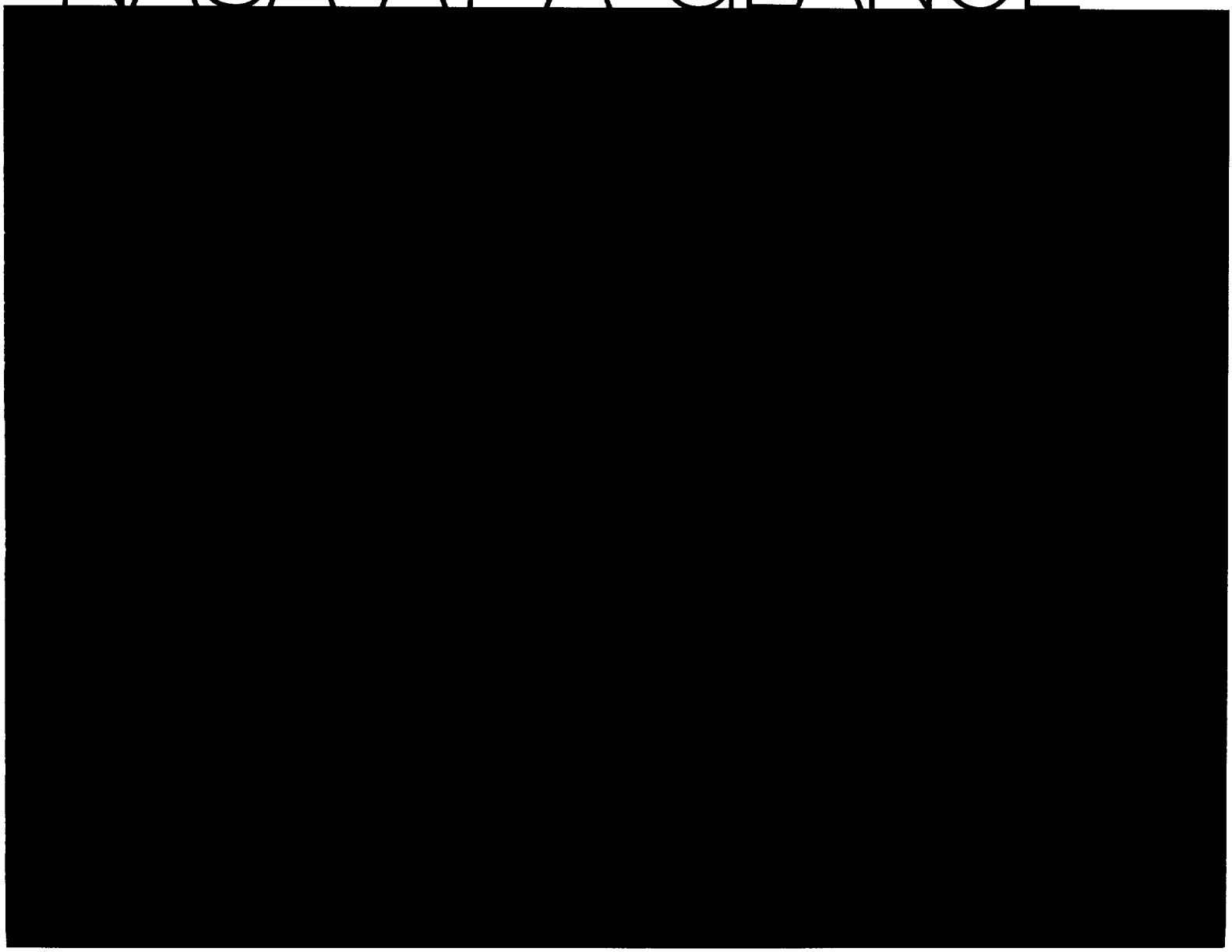
This Accountability Report covers Federal Fiscal Year 1999 (October 1, 1998, through September 30, 1999) with discussion of some subsequent events.

This report highlights NASA's program accomplishments and performance measures and summarizes its stewardship over budget and financial resources, including the Agency's audited financial statements and footnotes. We received an unqualified opinion from [illegible] public auditors. The auditor's opinion on NASA's financial statements, the report on internal control, and the report on NASA's compliance with laws and regulations are also included.

NASA's Accountability Report and other information about the NASA programs are available through the Internet on NASA's Home Page at *http://www.nasa.gov*. The NASA Home Page is updated on an ongoing basis with current information relating to the NASA programs and our administration of those programs.



NASA AT A GLANCE



NASA is a Federal research and engineering agency that accomplishes most of its space, aeronautics, science, and technology programs through Field Centers and contractors across the United States. The NASA organization consists of approximately 18,600 employees located at Headquarters and nine Centers (see "NASA Organization" and "NASA Centers of Excellence"). It also operates, through a contract with the California Institute of Technology, the Jet Propulsion Laboratory (JPL), a Federally Funded Research and Development Center. NASA's program and support activities are guided by a comprehensive strategic planning process. The Agency's accomplishments have been significant, especially in light of budgetary levels that have continued to decline over the past 10 years.

Program

The aeronautics and space program consists of a variety of national programs, projects, and activities. NASA has detailed and comprehensive program, project, and subproject requirements that are consistent throughout the Agency and its systems, including budget and accounting. The management of programs is organized around four Strategic Enterprises:

- Space Science
- Earth Science
- Human Exploration and Development of Space
- Aero-Space Technology

Agency programs are managed by these Enterprises, through which we implement our mission and communicate with our external customers. For example, Space Science manages the Hubble Space Telescope and current missions to other planets. Earth Science is responsible for our growing knowledge of Earth as a planetary system. Human Exploration and Development of Space is responsible for the Space Shuttle and the International Space Station. Aero-Space Technology is responsible for advances in the capabilities and safety of civil aviation, as well as improved access to space. Additional information on programs is contained in the planning and budget and performance sections of this report.

An electronic copy of this report and further detailed information can be found at NASA's web site at *http://www.nasa.gov*, including the Agency's Strategic and Performance Plans, which contain a graphic linking NASA's vision, mission, and roadmaps for the missions, goals, and objectives of the Enterprises.

Organization

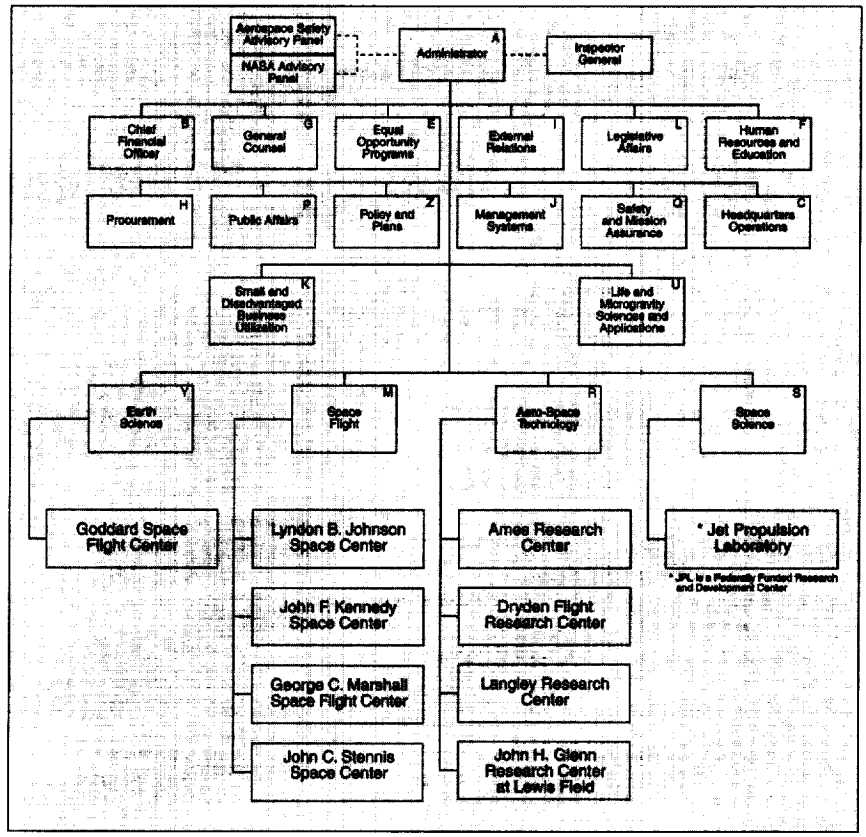
The NASA team is a diverse group at Headquarters and the Centers. NASA also relies on large and small contractors, members of the academic community, other Federal agencies, state and local agencies, and other space agencies throughout the world.

Headquarters

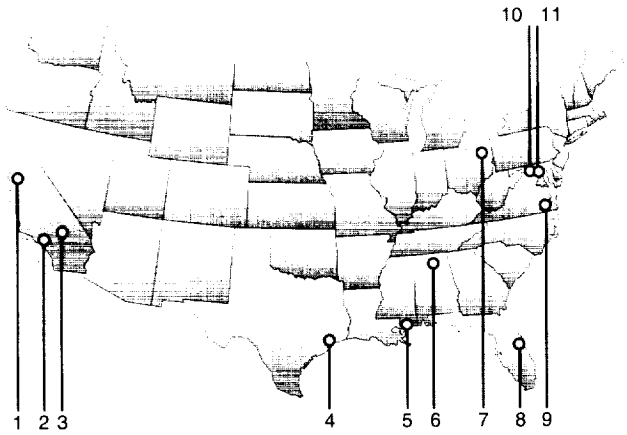
The Headquarters organization consists of the Office of the Administrator, four Strategic Enterprises, Functional and Staff Offices, and the Office of the Inspector General (OIG). The Office of the Administrator directs the Agency in carrying out the policies approved by the President and Congress, as well as overseeing administrative and program management. The Strategic Enterprises have primary responsibility for strategic goals, objectives, and programs and for serving NASA customers. The Strategic Enterprises also oversee the Centers.

Agency Functional and Staff Offices establish and disseminate policy and leadership strategies in their areas of responsibility. As a group, they serve in an advisory capacity to the Administrator and work in partnership with Enterprise Associate Administrators and Center Directors to ensure that activities are being conducted in accordance with all statutory and regulatory requirements, including fiduciary responsibilities. They also advise the Administrator and senior managers of potential efficiencies to be gained through standardization and consolidation and coordinate the implementation of approved initiatives.

The OIG serves as an independent audit, inspection, and investigative



NASA Organization



1	**Ames Research Center**	Information Technology
2	**Jet Propulsion Laboratory***	Deep Space Systems
3	**Dryden Flight Research Center**	Atmospheric Flight Operations
4	**Johnson Space Center**	Human Operations in Space
5	**Stennis Space Center**	Rocket Propulsion Test and Commercial Remote Sensing
6	**Marshall Space Flight Center**	Space Propulsion Transportation Systems Development, and Optics Manufacturing Technology
7	**Glenn Research Center**	Aeropropulsion and Aerospace Power Systems Research and Technology
8	**Kennedy Space Center**	Launch and Payload Processing Systems
9	**Langley Research Center**	Structures and Materials
10	**NASA Headquarters**	Agency Management
11	**Goddard Space Flight Center**	Scientific Research

* A Federally Funded Research and Development Center

NASA Centers of Excellence

organization by performing audits, reviews, inspections, and investigations. The OIG prevents and detects crime, fraud, waste, and abuse and assists management in promoting economy, efficiency, and effectiveness in its programs and operations. OIG auditors, evaluators, and agents are located at Headquarters, the Centers, and the Jet Propulsion Laboratory.

Centers

Scientific and engineering work is largely carried out at the Centers and the Jet Propulsion Laboratory. These installations are Centers of Excellence in various scientific and engineering specialties as well as their assigned missions. Additional work is carried out by offsite contractors, the academic community, and international partners.

Planning

NASA has steadily improved its planning and management processes consistent with the Government Performance and Results Act. NASA aligns its organizational and program structure with the requirements of the Agency's customers and stakeholders, and integrates its strategic planning, budgeting, and performance management, accounting, and reporting activities.

NASA has developed statements of its vision, mission, and the fundamental scientific and engineering questions addressed by its programs. These statements provide a foundation for its goals and objectives. The Agency's vision, mission, goals, and objectives are a product of close collaboration with customers, partner agencies (which are carrying out related programs), and stakeholders in the Administration and Congress. These

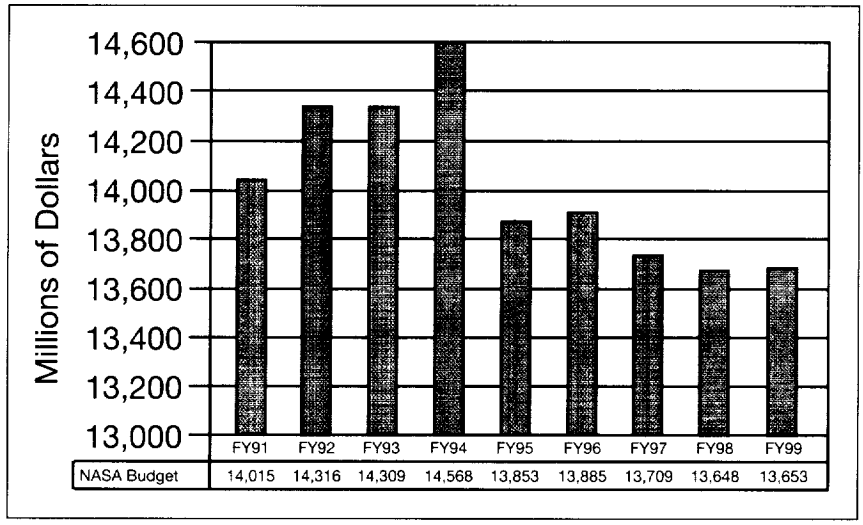
goals and objectives are supported by the budget described on subsequent pages of this section.

Progress toward the achievement of goals and objectives is described in the performance and crosscutting sections of this document. These sections provide the detailed performance goals and accomplishments for each Strategic Enterprise and the four Crosscutting Processes. Products and services are delivered to customers through work processes that cut across the agency's Enterprises and Functional and Staff Offices. The Crosscutting Processes are Manage Strategically, Providing Aerospace Products and Capabilities, Generate Knowledge, and Communicate Knowledge. Details are available in the Strategic Plan at *http://www.nasa.gov.*

The OIG has its own Strategic Implementation Plan. Each program area—Audits, Investigations, and Inspections—is preparing a more detailed implementation plan, including appropriate metrics and will report separately on its accomplishments.

Budget

The Agency budget for the past 3 years has averaged approximately $13.6 billion per year. Funding is currently received through the following appropriations:

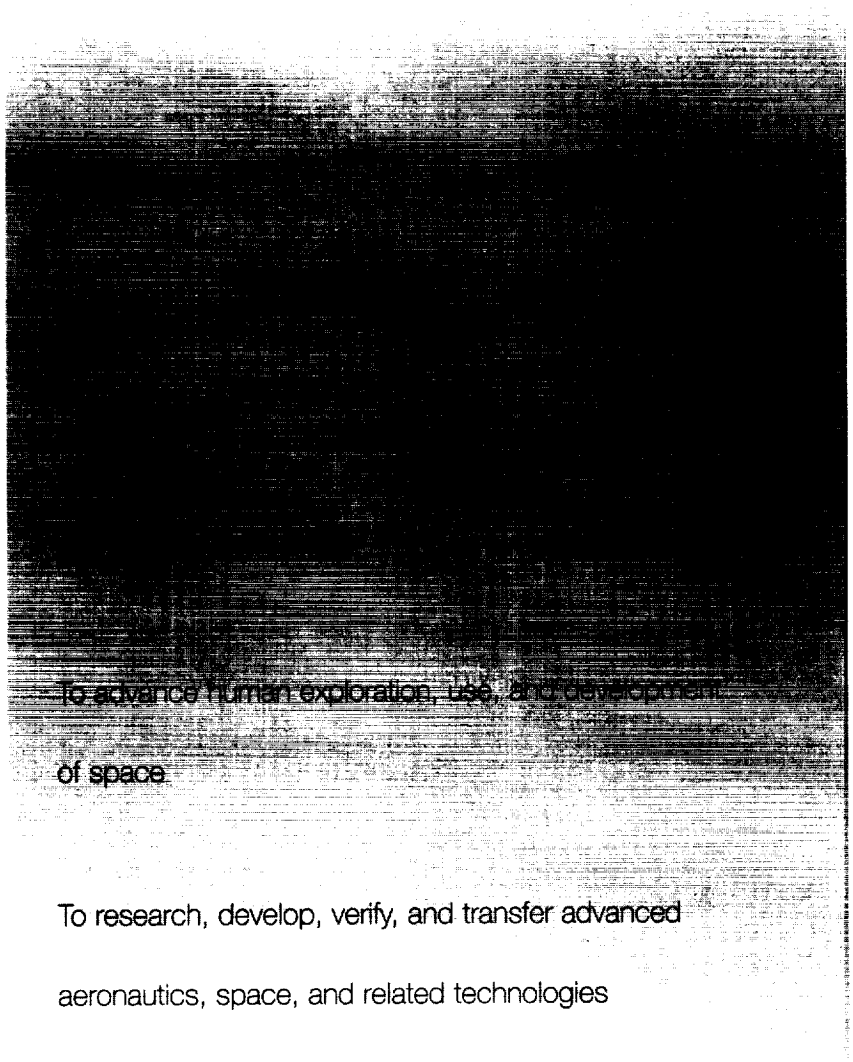


Budget Trends

- Human Space Flight—This appropriation provides for the International Space Station and Space Shuttle programs, including flight support for cooperative programs with Russia and other nations.
- Science, Aeronautics, and Technology—This appropriation provides funding for various research and development activities: Earth and Space Science, Aeronautics, Life and Microgravity Sciences, Technology Investments, Education Programs, and Mission Communication Services.
- Mission Support—This appropriation provides funding for space communications services, safety and quality assurance activities, facilities maintenance and construction activities to preserve the core infrastructure, environmental remediation, and civil service workforce.
- Inspector General—This appropriation provides funding for the staffing and support required to perform audits, evaluations, and investigations of programs and operations.

Budget Trends

NASA's share of Federal spending has declined from a high of 4 percent of the Federal budget in 1966, at the height of the Apollo program, to less



than 1 percent. Over the past 10 years, the NASA budget has continued to decline. See "Budget Trends." Important scientific and engineering advances continue to be made with fewer resources.

Recent Program Trends

In the face of declining budgets, changes have been made in program emphasis during the last few years. The Agency has reoriented its budgets consistent with its strategic planning and missions—explore, use, and enable the development of space; advance scientific knowledge; and research, develop, verify, and transfer space-related technologies. Declining resources have been allocated to mission-related top priorities: safely operating the Space Shuttle, developing and operating the International Space Station, and maintaining a strong program of science and technology development.

How Budget Resources Are Spent

NASA spends the greatest part of its resources through contracts for a wide variety of programs for related support and services, as well as the acquisition of capital assets. NASA also supports a civil service workforce and spends significant resources through grants, principally research grants with colleges and universities. A variety of reimbursable programs are also provided to

Federal, commercial, and international agency customers.

NASA Budget Request for FY 2001

The budget request for Fiscal Year (FY) 2001 reaffirms the Agency's commitment to a balanced aeronautics and space program. Priorities include a commitment to safety for human aeronautics and space flight, the assembly of the International Space Station, and the development of the Next Generation Launch Vehicle. The budget also provides support for an aggressive space science program, a program of long-term observation, research, and analysis of Earth from space, and revolutionary advancements that will sustain global U.S. leadership in civil aeronautics and space. Steps have been taken to minimize support costs, while focusing on low-cost, high-payoff missions to maximize output from a decreasing budget base.

Under the current appropriations structure and that for FY 2001, the Mission Support appropriation carries a portion of the direct support required to execute Enterprise programs. This includes research and operations support and civil service salaries and travel. As NASA moves into the era of full-cost management, the budget for these supporting elements is expected to be directly allocated to programs and projects.

NASA Fundamental Questions

1. **How did the universe, galaxies, stars, and planets form and evolve? How can our exploration of the universe and our solar system revolutionize our understanding of physics, chemistry, and biology?**

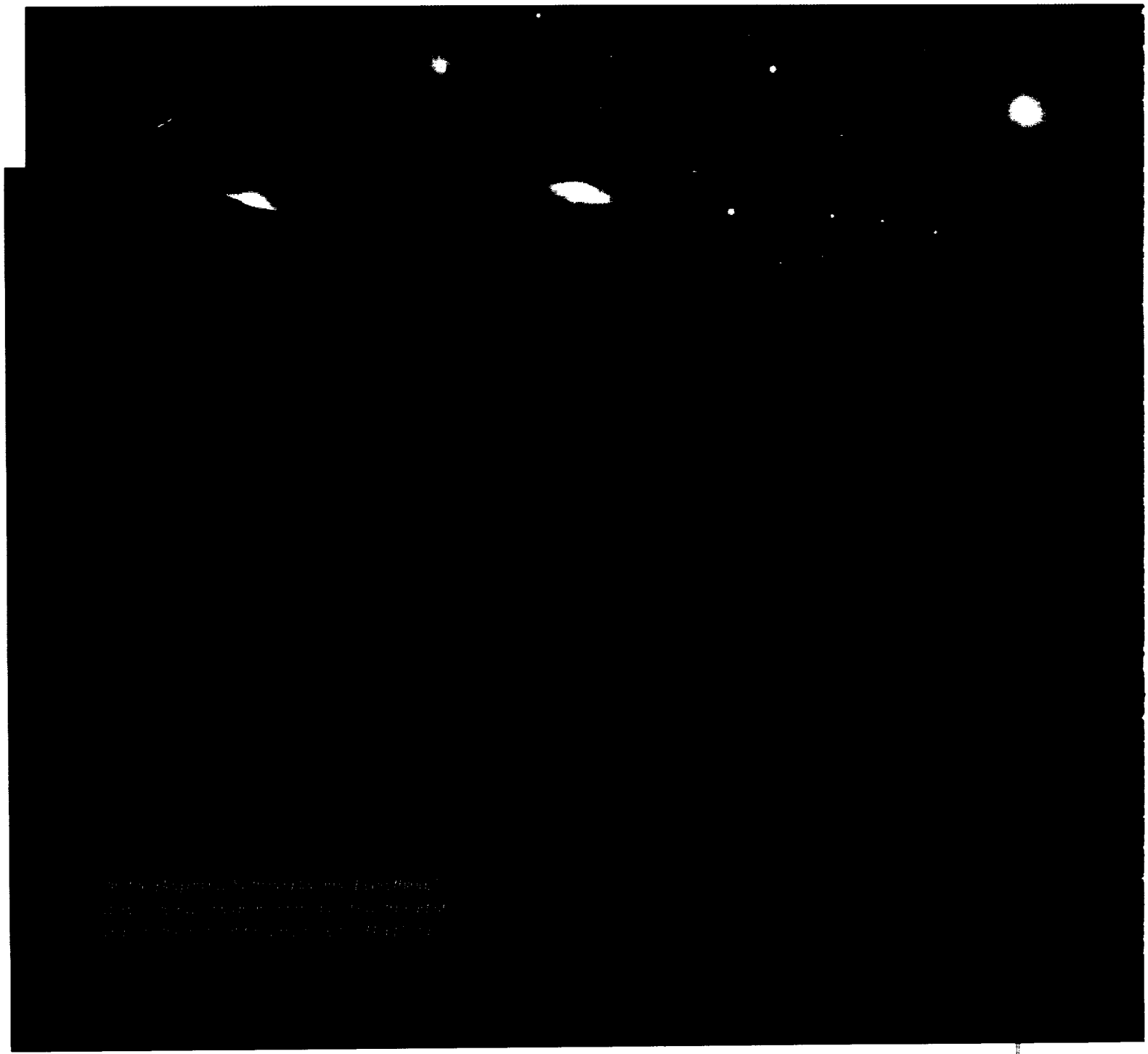
2. **Does life in any form, however simple or complex, carbon-based or other, exist elsewhere than on planet Earth? Are there Earth-like planets beyond our solar system?**

3. **How can we utilize the knowledge of the Sun, Earth, and other planetary bodies to develop predictive environmental, climate, natural disaster, and natural resource models to help ensure sustainable development and improve the quality of life on Earth?**

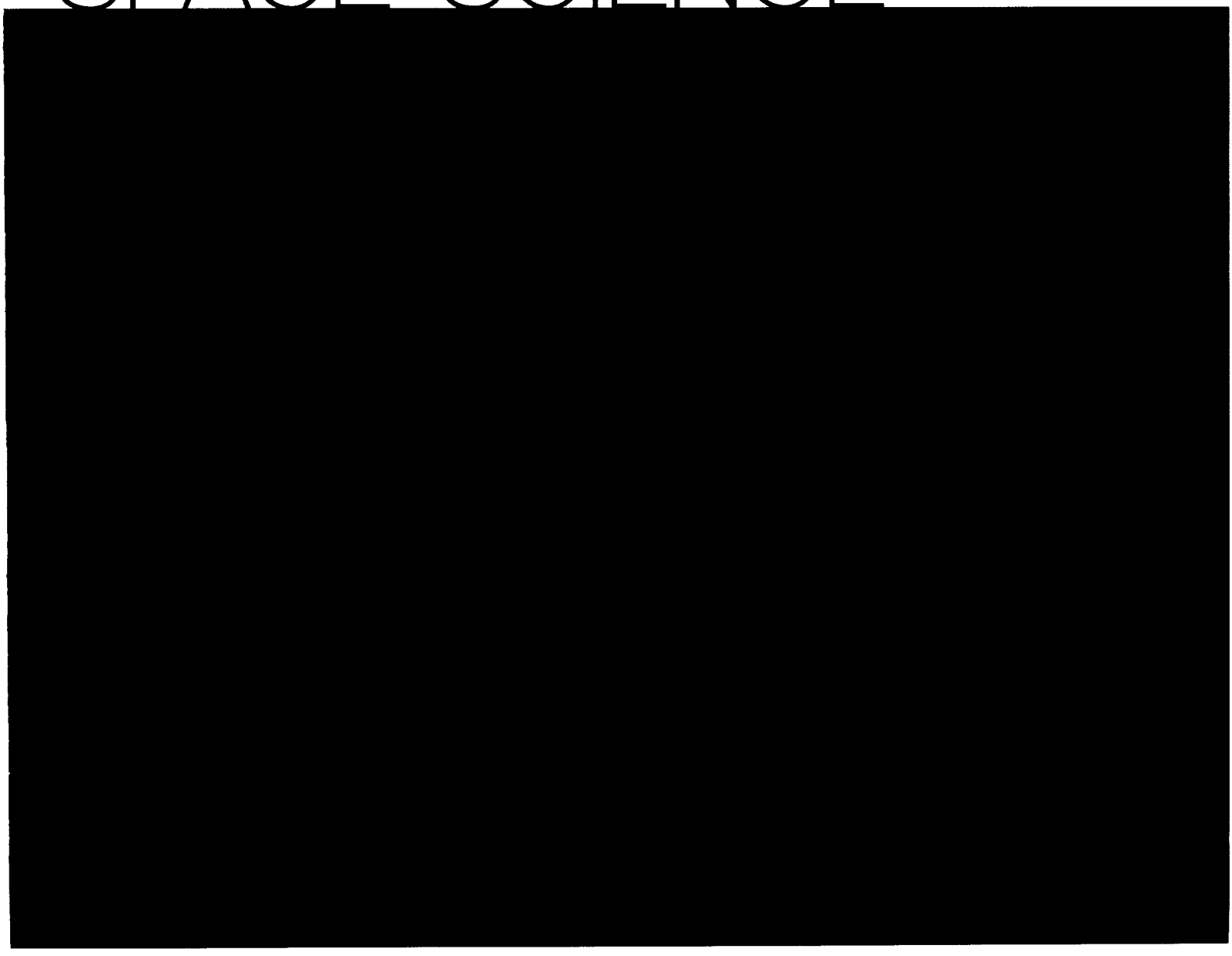
4. **What is the fundamental role of gravity and cosmic radiation in vital biological, physical, and chemical systems in space, on other planetary bodies, and on Earth, and how do we apply this fundamental knowledge to the establishment of permanent human presence in space to improve life on Earth?**

5. **How can we enable revolutionary technological advances to provide air and space travel for anyone, anytime, anywhere more safely, more affordably, and with less impact on the environment and improve business opportunities and global security?**

6. **What cutting-edge technologies, processes, and techniques and engineering capabilities must we develop to enable our research agenda in the most productive, economical, and timely manner? How can we most effectively transfer the knowledge we gain from our research and discoveries to commercial ventures in the air, in space, and on Earth?**



SPACE SCIENCE



Mission and Questions

The Space Science Enterprise (SSE) serves the human quest to understand our origin, existence, and fate. Broadly stated, the SSE mission is to solve mysteries of the universe, explore the solar system, discover planets around other stars, and search for life beyond Earth. In pursuing this mission, we develop, use, and transfer innovative space technologies that support all of NASA's Enterprises and contribute to the Nation's global competitiveness. We provide scientific support to NASA's human exploration program and use our knowledge and discoveries to enhance science, mathematics, technology education, and the scientific and technological literacy of all Americans.

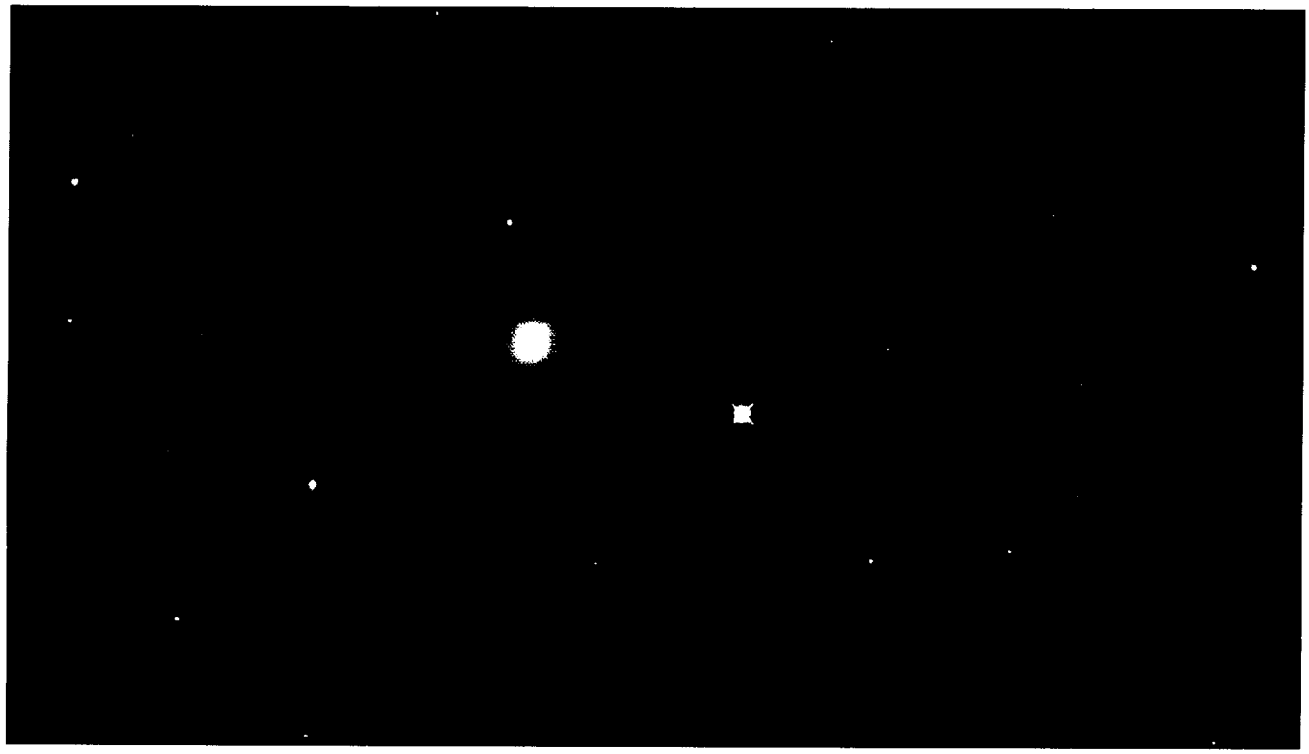
Fundamental questions for SSE are:

- How did the universe begin, and what is its ultimate fate?
- How do galaxies, stars, and planets form and evolve?
- What physical processes take place in extreme environments such as black holes?
- How and where did life begin?
- How is the evolution of life linked to planetary evolution and to cosmic phenomena?
- How and why does the Sun vary and how do Earth and the planets respond?
- How might humans inhabit other worlds?

Goals and Objectives

In carrying out its mission, SSE's long-term goals are as follows:

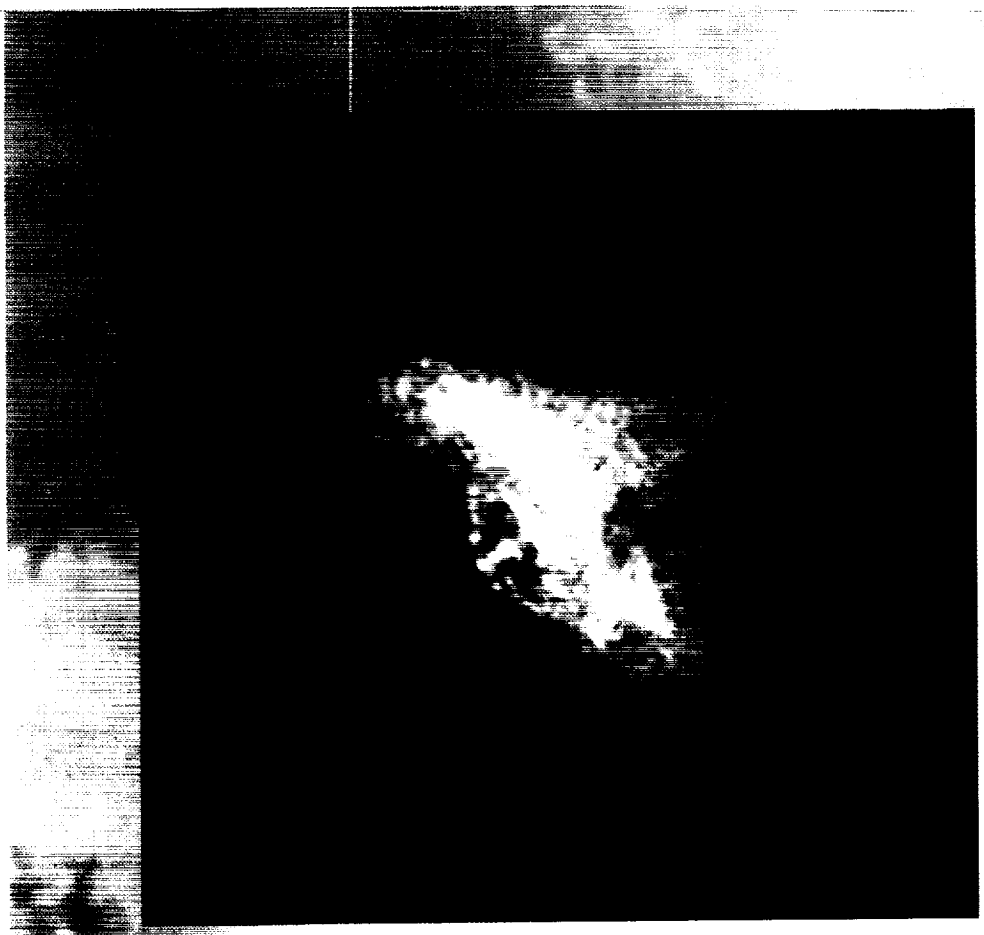
- Establish a virtual presence throughout the solar system, and probe deeper into the mysteries of the universe and life on Earth and beyond—a goal focused on the fundamental science we will pursue
- Pursue space science programs that enable and are enabled by future human exploration beyond low-Earth orbit—a goal exploiting our



Hubble Illuminates the Universe's Rate of Expansion

synergy with the human exploration of space
- Develop and utilize revolutionary technologies for missions impossible in the past—a goal recognizing the enabling character of technology
- Contribute measurably to achieving science, mathematics, and technological education goals of our Nation, and share widely the excitement and inspiration of our mission and discoveries—a goal reflecting our commitment to education and public outreach

SSE's near-term objectives are identified in the Space Science Roadmap in the NASA Strategic Plan and are elaborated in the Space Science Enterprise Strategic Plan. As described in those plans, these objectives are pursued through a comprehensive and balanced program of space science flight missions, technology development, and supporting scientific research.



Chandra X-ray Image of Crab Nebula

ccomplishments and
rformance Measures

some well-publicized mission
in 1999, notably the loss of the
mate Orbiter and Mars Polar
pon their arrivals at Mars, SSE
d a number of successes and
o generate a stream of excit-
discoveries. Hubble scien-
e for how fast the uni-
ding after 8 years of
urement. The rate of
the Hubble Constant, is
determining the age and size
se. Measuring Hubble's con-
one of the three major goals
escope when it was launched
See "Hubble Illuminates the
's Rate of Expansion."

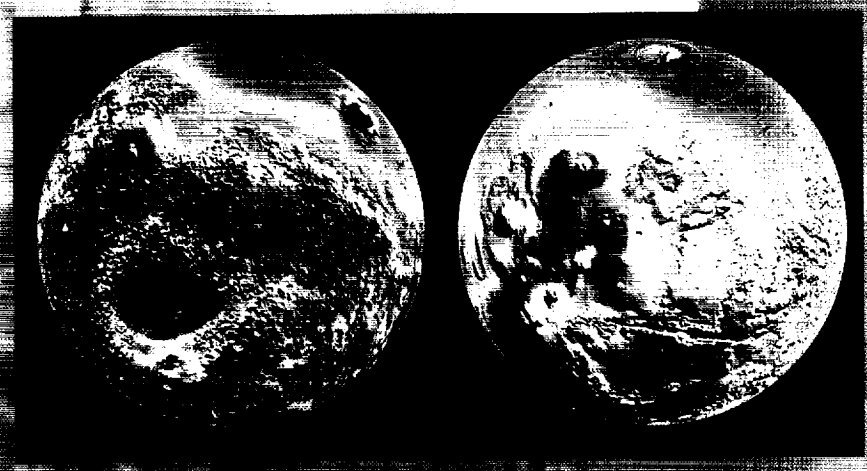
decade in development, the
Observatory (CXO) was
ed in July 1999 and
is working well. After barely 2 months in space, CXO took a stunning image of the Crab Nebula, the most intensively studied object beyond our solar system, and revealed something never before seen: a brilliant ring around the nebula's heart. Many other images have been released, and initial scientific results have been very exciting. See "Chandra X-ray Image of Crab Nebula."

Astronomers funded by NASA witnessed for the first time a distant planet passing in front of its star, providing direct and independent confirmation of the existence of extrasolar planets that to date has been inferred only from the wobble of their star. Other NASA-funded astronomers added to the list of known extrasolar planets, bringing the count to approximately 30 by the end of the year.

An impact basin deep enough to swallow Mount Everest and surprising slopes in Valles Marineris highlight a global map of Mars that will influence scientific understanding of the Red Planet for years. Generated by the Mars Orbiter Laser Altimeter (MOLA), the high-resolution map represents millions of measurements gathered in 1998 and 1999. Evidence from this map has recently been interpreted to suggest that an enormous ocean once existed on Mars. See "Mars Global Surveyor Provides First Global 3-D Map of Mars."

Astronomers racing the clock managed to take the first-ever optical images of one of the most powerful explosions in the universe—a gamma ray burst—just as it was occurring on January 23, 1999. Such bursts occur with no warning and typically last just for a few seconds.

The Galileo spacecraft continued its investigations of Jupiter's moons, greatly expanding the understanding of the history



Views of Europa

Eight of the 10 required Europa data-taking flybys were successfully completed. Approximately 0.7 percent of the surface of Europa has been covered at 30-meter resolution, but over 90 percent has been covered at lower resolution. Data collected will help determine the presence and state of water, a central consideration in understanding the possibility of life on the moon. See "Views of Europa."

In the technology area, the Deep Space 1 mission successfully demonstrated all 12 of its advanced technology systems, including the first demonstration of an ion drive for primary propulsion. Successful demonstration in space opens the door for each of the validated components to be incorporated in future science missions, resulting in lower cost, better performance, or both. See "Deep Space 1 Encounter With an Asteroid."

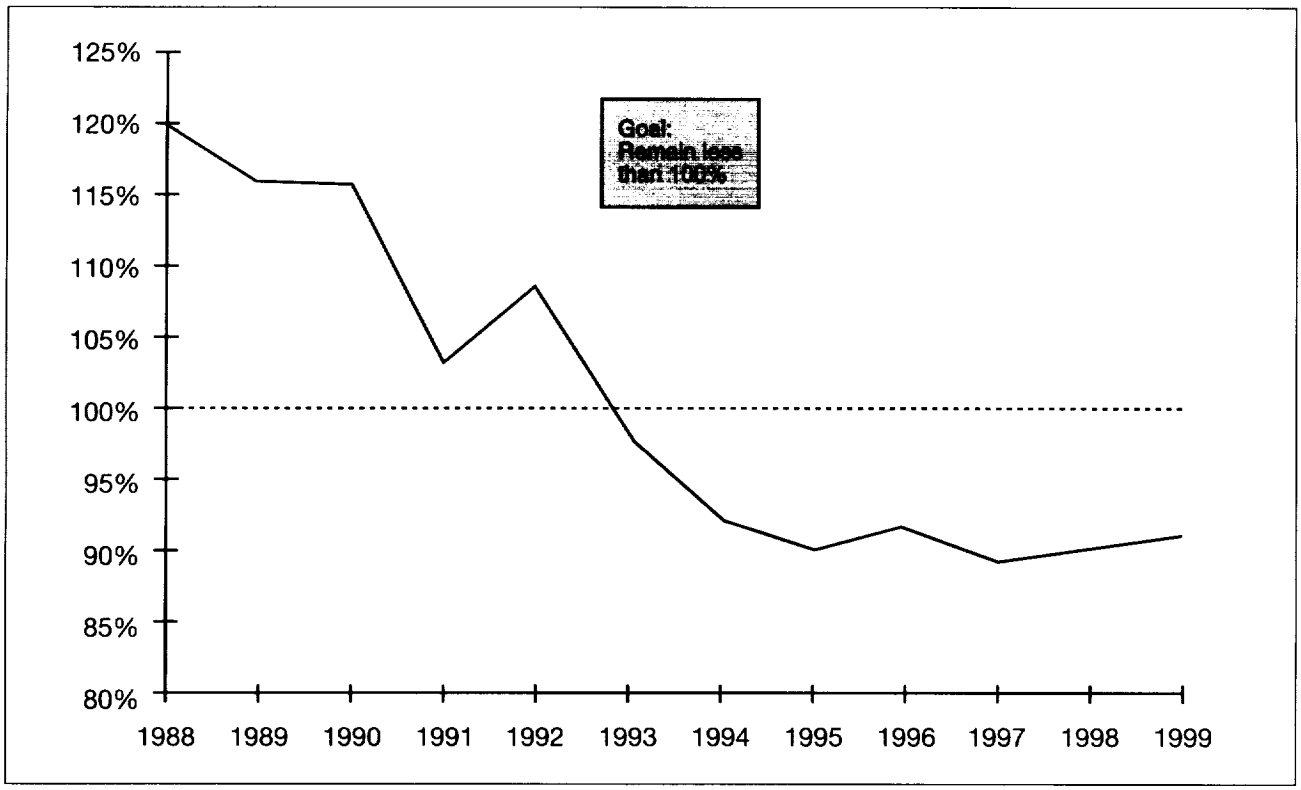
Significant progress was achieved in education and public outreach as implementation of the Enterprise's wide-ranging and systematic approach to sharing results of its missions and research began to reach maturity. All new flight programs now have funded components for outreach, and the national space science network for collecting and disseminating educational materials is in place. These steps lay the groundwork for an expanded realization of the benefits of space science expenditures in American society.

SSE tracks programwide performance measures for several project-related areas: annual flight rate, spacecraft development time, development cost, and total program cost versus commitment. Activities in these areas support all of the scientific objectives of the Enterprise, and performance in them reflects the Enterprise's strategy to "sustain an aggressive program of discovery while using lower cost missions." Furthermore, near-term SSE objectives support the Agency near-term goals, as depicted in the NASA Roadmap, "chart the evolution of the universe, from origins to destiny, and understand its galaxies, starts, planets, and life" and "develop robotic missions as forerunners to human exploration beyond low-Earth orbit." These metrics specifically address the NASA strategy as noted in the NASA Roadmap to "deliver world-class programs and cutting-edge technology through a revolutionized NASA."

Deep Space 1 Encounter With an Asteroid

Program Cost Status Versus Cost Commitment Performance Measure

This measures the annual estimated cost of major missions in development versus commitment to Congress. A gauge of success in meeting cost performance commitments for major development programs within the Enterprise, this measure is the ratio of the present budget



Program Cost Status Versus Cost Commitment

estimates compared to the commitments made by the Agency to Congress on the maximum cost for each major SSE spacecraft. The commitment to Congress is established at the time the program moves from planning and design into development. The goal is to remain below 100 percent, demonstrating that SSE is doing better than its commitments to Congress in holding down the cost of major spacecraft.

This area has shown continued improvement in recent years; many larger missions which exceeded their cost commitments have been launched, while most recent missions are being completed within or under commitment. For FY 2000 through 2001, it is expected that our actual performance on this metric will likely stay between 90 and 100 percent. In FY 1999, the average cost of major SSE missions in development was estimated to be 91 percent of commitments to Congress, an excellent performance rating. See "Program Cost Status Versus Cost Commitment."

In addition to science and mission goals, SSE also tracks its ongoing performance in providing benefits to society, including public science awareness and postsecondary education.

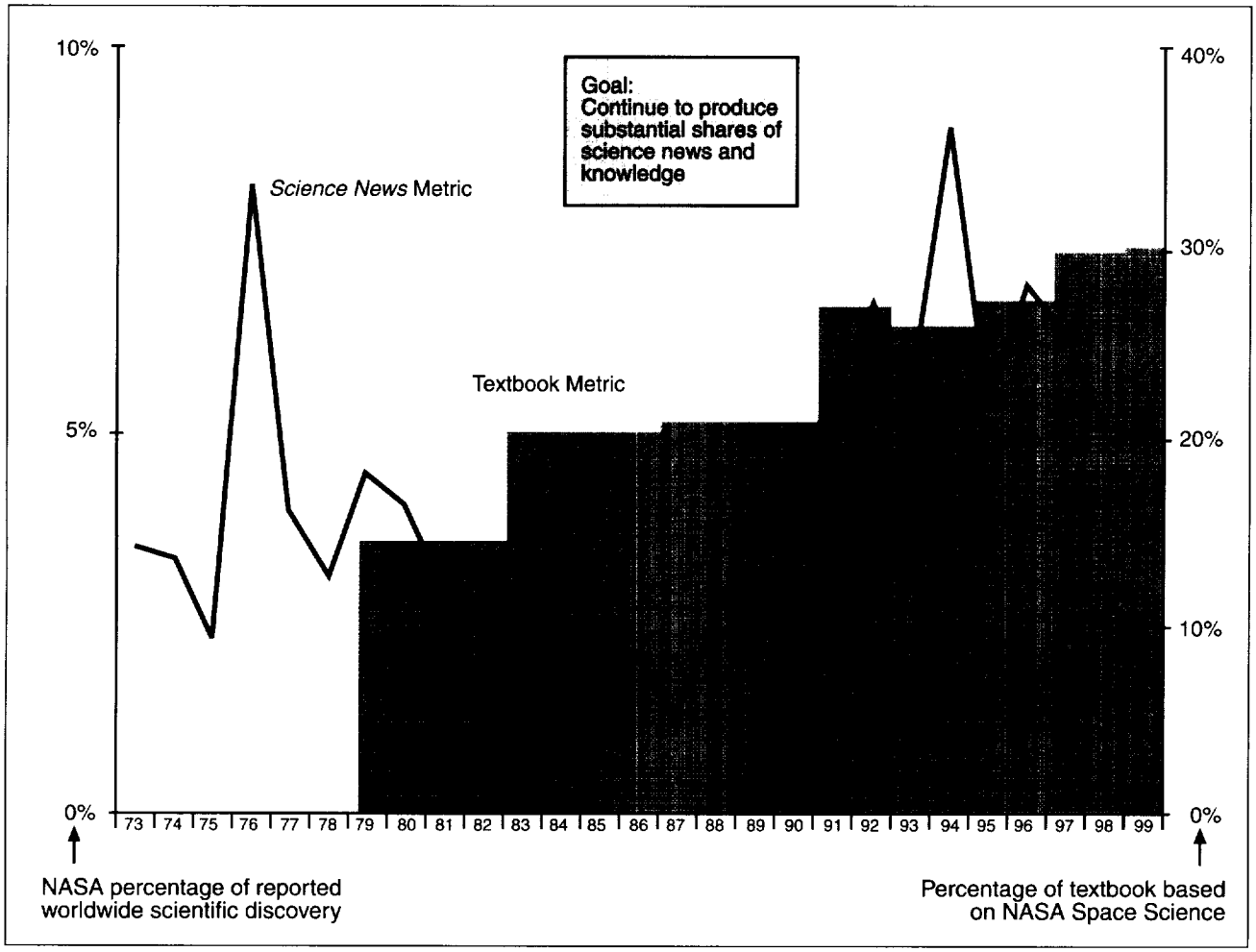
Providing Benefits to Society Performance Measure

SSE continues to use our knowledge and discoveries to enhance science, mathematics, and technology education and the scientific and technological literacy of all Americans. This objective contributes to the achievement of the goal in the NASA Roadmap to "share new knowledge with our customers and contribute to educational excellence." Furthermore, this objective responds specifically to the NASA mission "to advance and communicate scientific knowledge and understanding." Two metrics are tracked as general indicators of success in this area: a measure of the percentage of the year's most noteworthy science achievements attributable to SSE programs and a measure of the educational impact of NASA's science contributions at colleges and universities across the Nation.

Performance on these metrics is best assessed by looking at long-term trends. The goal of these metrics is for NASA to continue to produce a substantial share of science news and textbook contributions. The science impact measure is based on *Science News* magazine's end-of-year summary of approximately

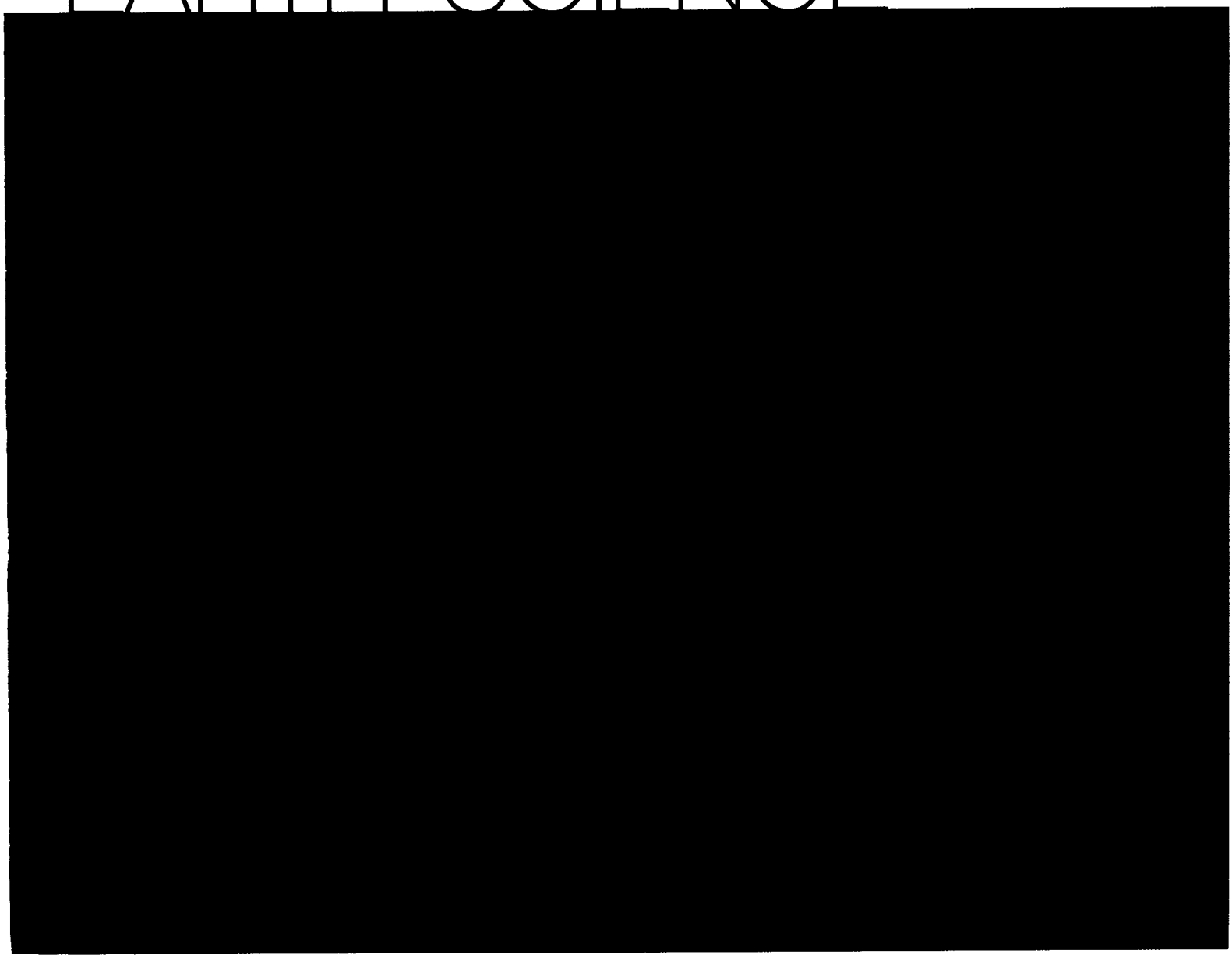
150 "most important stories" from all fields of science. By the level of its contribution to this independent ranking of science results, SSE's work can be compared to NASA's historical performance and current worldwide scientific output in terms of relevancy and interest to the public. In 1999, space science accounted for 5 percent of the "most important stories," well above the historical average.

The educational impact measure is based on the percentage of NASA's contribution to a leading college space science textbook *Astronomy: From the Earth to the Universe* by Jay Pasachoff over time (from 1975 to 1996). A 24-page supplement to the college textbook was published in 1999; combining the portion of the new material based on NASA's space science program with the previous analysis of the most recent edition of the textbook, the new total contribution is 31 percent. This metric is derived from information received from Enterprise education and public outreach functions and provides an independent indication of the Agency's contributions to the educational needs of students. See "Providing Benefits to Society."



Providing Benefits to Society

EARTH SCIENCE



Mission and Questions

The Earth Science Enterprise (ESE) mission is to understand the total Earth system and the effects of natural and human-induced changes on the global environment and to conduct global and regional research requiring the vantage point of space. ESE programs advance the new discipline of Earth system science, with a near-term emphasis on global climate change. In concert with research and industry partners, research results will contribute to the development of environmental policy and economic investment decisions. Knowledge and discoveries are shared with the public to enhance science, mathematics, and technology education and increase the scientific and technological literacy of all Americans. The same spirit of innovation that embodies the ESE flight programs applies to technology development.

Obtaining data from the private sector where applicable is an emerging feature of the Enterprise strategy to reduce costs and encourage growth of a viable commercial remote-sensing industry in the United States.

ESE addresses most directly two of the six fundamental questions NASA has established to focus its activities:

- How can we utilize the knowledge of the Sun, Earth, and other planetary bodies to develop predictive environmental, climate, natural disaster, and natural resource models to help ensure sustainable development and improve the quality of life on Earth?
- What cutting-edge technologies, processes, and techniques and engineering capabilities must we develop to enable our research agenda in the most productive, economical, and timely manner? How can we most effectively transfer the knowledge we gain from our research and discoveries to commercial ventures in the air, in space, and on Earth?

Goals and Objectives

ESE has established these goals and objectives to fulfill its mission:

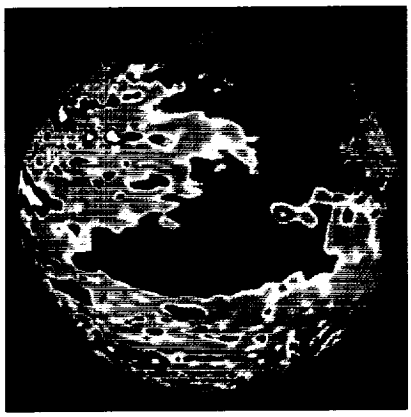
- Expand scientific knowledge of the Earth system using NASA's unique capabilities from the vantage points of space, aircraft, and *in situ* platforms:
  - Understand the causes and consequences of land-cover and land-use change and impacts on sustained productivity
  - Develop and improve the capability to predict seasonal-to-interannual climate variability
  - Understand Earth system processes to better predict natural hazards and mitigate natural disasters
  - Understand the causes and impacts of long-term climate variations on global and regional scales
  - Understand the concentrations and distributions of ozone in the stratosphere and troposphere
- Disseminate information about the Earth system:
  - Improve the dissemination of Earth Science research results
  - Increase public understanding of Earth system science through education and outreach
- Enable the productive use of ESE science and technology in the public and private sectors:
  - Develop and transfer advanced remote sensing technology
  - Extend the use of ESE research to national, state, and local applications
  - Support the development of a robust commercial remote-sensing industry
  - Make major scientific contributions to national and international environmental assessments.

Map of the Oceans

Accomplishments and Performance Measures

FY 1999 was a year of substantial scientific accomplishment in our understanding of the major elements that comprise the Earth system. Over the oceans, ESE reduced the uncertainty in global rainfall over the tropics by one-half, helping improve short-term weather prediction and availability of fresh water globally. ESE produced near-daily ocean color maps that help us understand the role of oceans in removing carbon dioxide from the atmosphere. See "Map of the Oceans." In addition, the Enterprise documented the waxing and waning of El Niño, enabling seasonal climate prediction, and resumed global measurement of winds at the ocean surface to improve short-term weather prediction and tracking of major hurricanes and tropical storms globally. See "View of El Niño."

The Sensor Intercomparison and Merger for Biological and Interdisciplinary Ocean Studies (SIMBIOS) project devel-



View of El Niño

oped algorithms to interrelate and compare data sets from different ocean color scanners, such as the India-sponsored Modular Optoelectronic Scanner (MOS) and the U.S. Sea-viewing Wide Field-of-view Sensor (SeaWiFS). These algorithms are used to merge the data sets and produce more comprehensive information about global ocean productivity. New data products quantifying global tree cover percentage were created using space-based observations as a first step toward improving estimates of aboveground carbon storage in global forests.

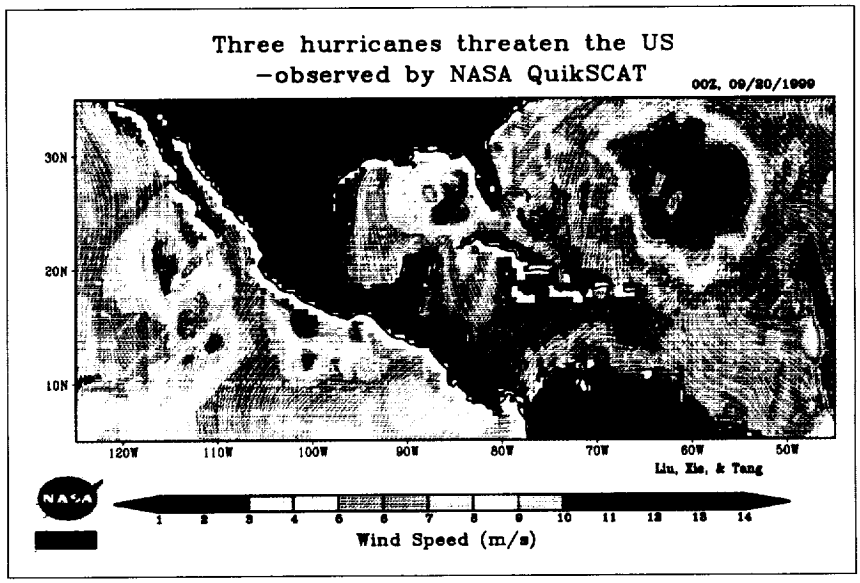
The Tropical Rainfall Measuring Mission (TRMM), launched in 1997, continued to gather information on rainfall in the tropics where two-thirds of global precipitation falls. This is the key to understanding Earth's hydrological cycle, one of the three major processes driving Earth's climate and the global heat balance that drives seasonal change.

The NASA Seasonal to Inter-annual Prediction Project (NSIPP) has implemented a baseline coupled climate prediction system, consisting of the Aries global atmospheric model coupled to the Poseidon global ocean model. Experimental forecasts are able to predict tropical Pacific sea-surface temperatures up to 6 months in advance. The ocean model has been successfully initialized using Special Sensor Microwave/Imager (SSM/I) surface winds data, a combination of *in situ* and remotely measured sea-surface temperatures and subsurface temperature data. An assimilation of sea-surface height data from the Ocean Topography Experiment/Poseidon (TOPEX/Poseidon) is now under way with the Ensemble Kalman Filter and will be used for the initialization of the coupled forecast experiments.

The Quik Scatterometer (QuikSCAT) spacecraft, launched in FY 1999, joins TRMM and the TOPEX/Poseidon to form a powerful suite of space-based observational assets to track phenomena such as El Niño/La Niña and major hurricanes, including the three that threatened the American coasts simultaneously in November of 1999. See "Three Hurricanes Threaten the United States."

Over the ice caps, researchers determined the thinning and thickening rates for the Greenland ice sheet, and provided the first detailed radar mosaic of Antarctica and daily observations of the polar regions from space. See "Detailed Radar Map of Antarctica."

Over the land, ESE produced the first satellite-derived assessments of global forest cover with the launch of Landsat 7,



Three Hurricanes Threaten the United States

began refreshing the global archive of 30-meter land cover data, and conducted an international field experiment in Amazonia to help understand the role of vegetation on Earth in removing carbon dioxide from the atmosphere.

ESE provided technology and instruments to allow for several new observations. Single-pass interferometric Synthetic Aperture Radar (SAR) data are collected; the first consistent global topography data from space. These data will have a variety of applications, including assessing flood hazards, laying out new roadways and pipelines, providing airline operators with detailed elevation data for remote areas, and helping disaster management in general.

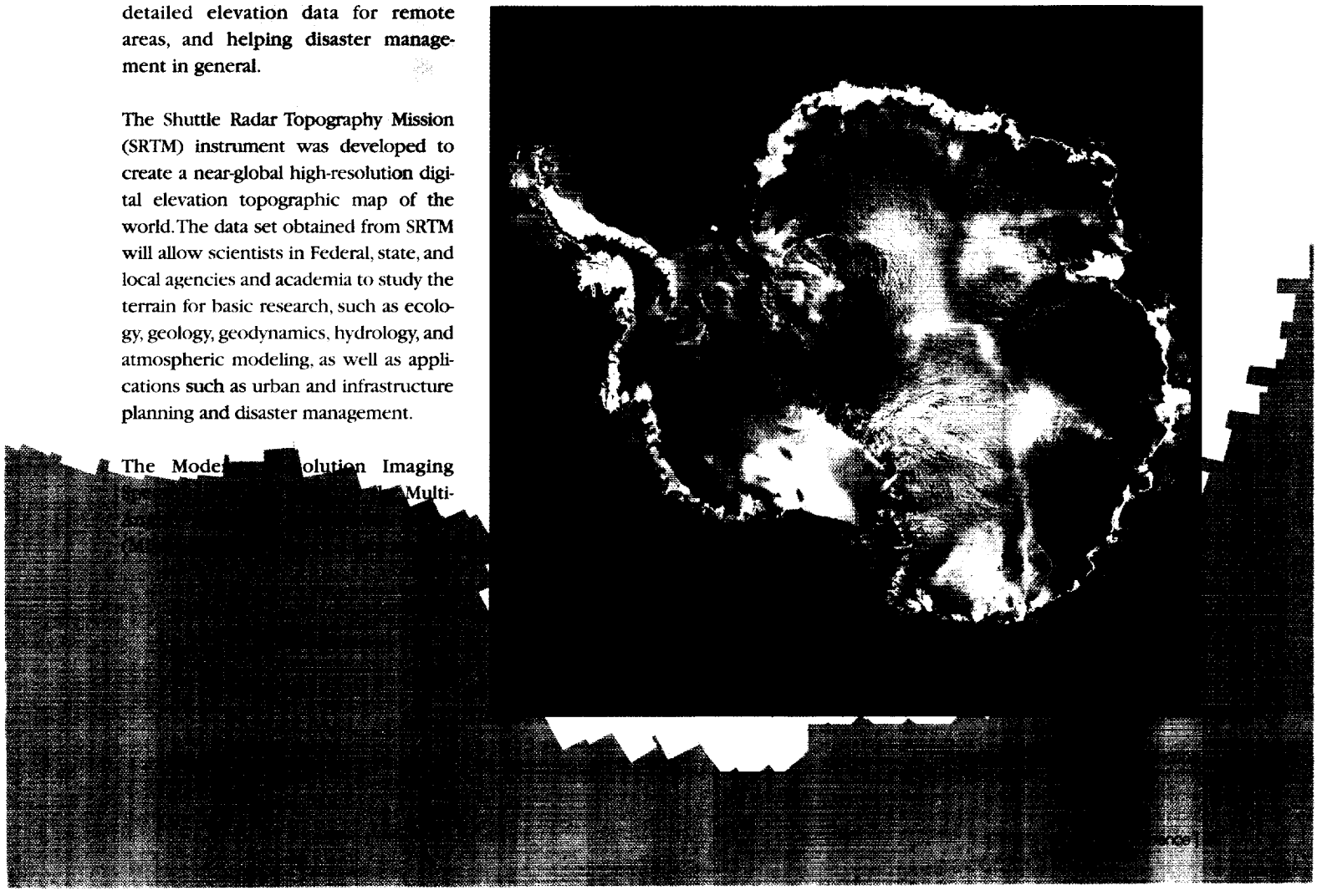
The Shuttle Radar Topography Mission (SRTM) instrument was developed to create a near-global high-resolution digital elevation topographic map of the world. The data set obtained from SRTM will allow scientists in Federal, state, and local agencies and academia to study the terrain for basic research, such as ecology, geology, geodynamics, hydrology, and atmospheric modeling, as well as applications such as urban and infrastructure planning and disaster management.

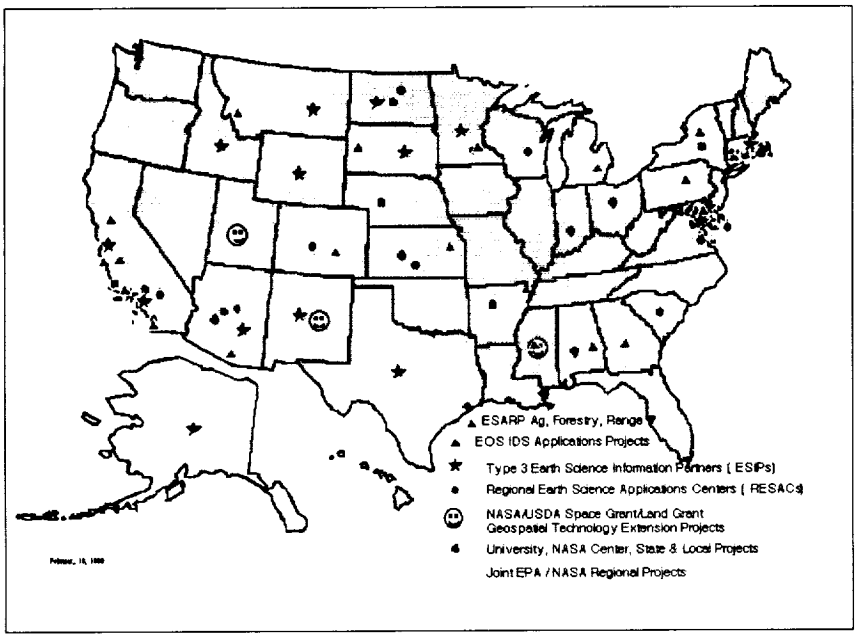
The Mode[illegible]olution Imaging [illegible]Multi-

Thermal Emission and Reflection Radiometer (ASTER) instruments have been developed to collect global and regional data on temperature and precipitation to measure the solar radiation reaching Earth. Data from these instruments, combined with data from the Clouds and the Earth's Radiant Energy System (CERES) will enable NASA to estimate Earth's solar and infrared radiative fluxes, which in turn will determine the heating and cooling of Earth and its atmosphere.

The Solid Earth and Natural Hazards program partnered with several disaster management practitioners, including the Federal Emergency Management Agency (FEMA) and state and local agencies, to better understand emergency management requirements and better communicate and apply science results, technology, and data to operational needs. Some highlights include:

- Interferometric SAR data have made important observational discoveries, including a nonlinear elastic crustal response to the Manyi earthquake in the Tibetan region. Such a response has only been observed





All ESARP Projects

previously in laboratory experiments.

- Interferometric SAR data have been used to identify and model the emplacement and movement of magma within active volcanoes, including Mt. Etna in Italy and Mammoth Mountain in California. This has provided insights into the internal workings of the volcanoes as well as assessments of their state of activity.
- Mathematical and numerical modeling infrastructure and capabilities for developing general earthquake models, measuring volcanic inflation and deflation, and integrating Global Positioning System (GPS) geodetic and interferometric SAR data for the inversion of crustal strain have been established.

In the atmosphere, ESE continued to measure concentrations of both ozone and ozone-depleting substances and assess the recovery of upper ozone correlation. The Enterprise implemented a 17-year data record of aerosols and cloud properties toward predicting annual to decadal climate variations via our satellite measurements from the Stratospheric Aerosol and Gas Experiment (SAGE). The Total Ozone Mapping Spectrometer (TOMS) continues to provide the global view of how ozone is responding to these reductions in atmospheric halogen burden. It is providing new data products, such as tropospheric ozone columns.

The Enterprise has continued to broaden its capabilities to maximize the dissemination and use of data and information. A working prototype federation program was begun in 1998, which is now beginning to mature as a coordinated network of Earth Science Information Partners. These partners are working with our Distributed Active Archive Centers (DAACs) to provide new research products and products targeted to specific communities involved within the applications, State and local government, and commercial sectors. We have also established the Regional Earth Science Applications Centers, focused on end-to-end projects involving academia, and a wide array of end user practitioners. See "All ESARP Projects."

ESE tracks three types of programwide performance measures: how well it makes data available to scientists, its contribution to Earth science education, and the practical application of its research.

Data Made Available to Scientists

NASA tracks these three performance measures regarding ESE's first-line customers—the scientists and others who use Earth science data products. Accordingly, ESE is making a substantial investment in data and information services to make these data products readily accessible. Science data products are made accessible through a set of DAACs. For 1999, NASA has achieved its goal of continued increases in these measures.

- A total 284 terabytes of data has been archived.
- A total of 1,233,666 users accessed the DAACs.
- A total of 5,783,425 data products has been delivered to users.

See "Data Volume Archived at the DAACs (in terabytes)," "Number of Distinct Users Accessing the DAACs," and "Number of Products Delivered by the DAACs."

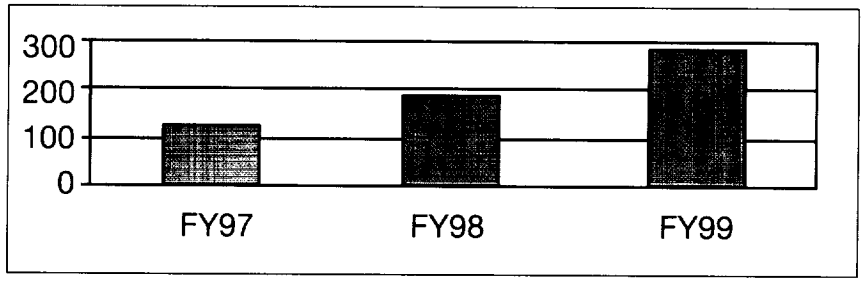
Education in Earth Sciences Performance Measures

Education in the Earth sciences is one of the key products of ESE. Its extensive and growing collection of science data and research results is used to develop new educational products and support curriculum development and teacher training. The Enterprise had the following accomplishments in FY 1999:

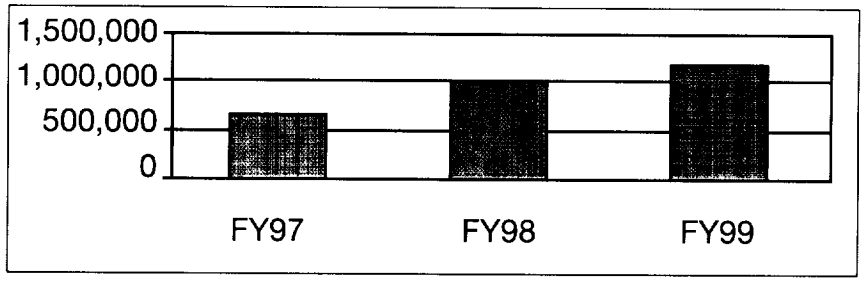
- ESE has an annual target of sponsoring at least 300 workshops to train teachers in the use of its education products. In FY 1999, 477 workshops were sponsored.
- ESE met its annual target of awarding 50 new graduate student research fellowships in FY 1999.
- ESE is a key participant in the Global Learning and Observations to Benefit the Environment (GLOBE) program, which involves schools in collecting temperature, precipitation, and related data around the world. The number of participating schools in FY 1999 was 7,610, and the number of participating countries was 84.

Practical Applications of Earth Science Performance Measure

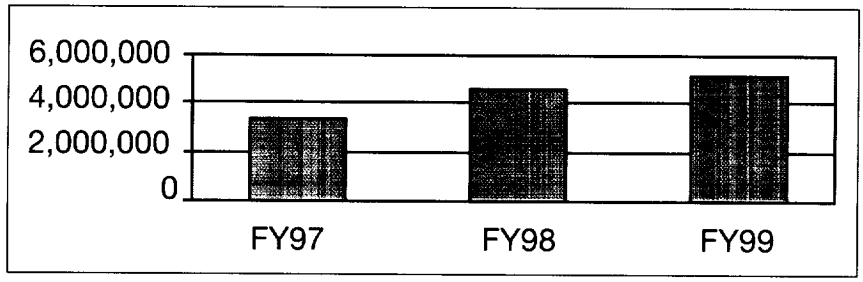
The Enterprise also has an interest in seeing that its research results in practical applications in the U.S. economy. To this end, the Commercial Remote Sensing Program, at Stennis Space Center, works with U.S. industries to help them become suppliers of remote-sensing data. The goal of this performance measure is to increase the number of partnerships with outside entities for using Earth science information. The Commercial Remote Sensing Program is engaged in more than 100 partnerships with commercial entities for the development of "value-added" remote-sensing information products. The number of partnerships increased significantly over 1998 (37) and exceeds the FY 1999 goal of 75.



Data Volume Archived at the DAACs (in terabytes)



Number of Distinct Users Accessing the DAACs



Number of Products Delivered by the DAACs

"Working in Space," oil by Linda Draper shows astronauts performing extravehicular activities (EVA) around the Shuttle's cargo bay area.

HUMAN EXPLORATION AND DEVELOPMENT OF SPACE

to open the space frontier

by exploring, using, and enabling

the development of space and to

expand human experience into

the far reaches of space

Mission and Questions

The mission of the Human Exploration and Development of Space (HEDS) Enterprise is to open the space frontier by exploring, using, and enabling the development of space and to expand the human experience into the far reaches of space. In exploring space, HEDS brings people and machines together to overcome challenges of distance, time, and environment. The Space Shuttle and the International Space Station (ISS) serve as research platforms to pave the way for sustained human presence in space through critical research on human adaptation. The Enterprise contributes new scientific knowledge by studying the effects of gravity and the space environment on important biological, chemical, and physical processes and develops biomedical knowledge and technology to allow people to thrive physically and psychologically while exploring and opening the space frontier.

HEDS seeks out synergies between commercial capabilities and Government needs—promoting investments in commercial assets as pathfinders in ISS commercial operations and reducing the cost of Space Shuttle operations through privatization, eventual commercialization, and flying payloads. HEDS serves as a catalyst for commercial space development by facilitating commercial research and product development on the ISS and the Space Shuttle.

HEDS pursues answers to numerous research and engineering questions as we learn to live and work in space, including:

- What is the fundamental role of gravity and cosmic radiation in vital biological, physical, and chemical systems in space, on other planetary bodies, and on Earth, and how do we apply this fundamental knowledge to the establishment of permanent human presence in space to improve life on Earth?

HEDS also plays an important role working with other Enterprises to pur-

sue answers to other fundamental questions, including:

- Does life in any form, however simple or complex, carbon based or other, exist elsewhere than on planet Earth?

Goals and Objectives

HEDS pursues the following goals and objectives to achieve its mission:

- Expand the space frontier:
  - Enable human exploration through collaborative robotic missions
  - Define innovative, safe, and affordable human exploration mission architectures
  - Invest in enabling high-leverage technologies
- Expand scientific knowledge:
  - In partnership with the scientific community, use the space environment to explore chemical, biological, and physical systems
- Enable and establish a permanent and productive human presence in Earth orbit:
  - Provide safe and affordable access to space
  - Deploy and use the ISS to advance scientific, exploration, engineering, and commercial objectives
  - Ensure and enhance the health, safety, and performance of humans in space
  - Meet strategic space mission operations' needs while reducing costs and increasing standardization and interoperability
- Expand the commercial development of space:
  - Facilitate access to space for commercial researchers
- Share the experience and discovery of human space flight
  - Engage and involve all Americans in the exploration and development of space
  - Increase the scientific, technological, and academic achievement of the Nation by sharing our knowledge, capabilities, and assets

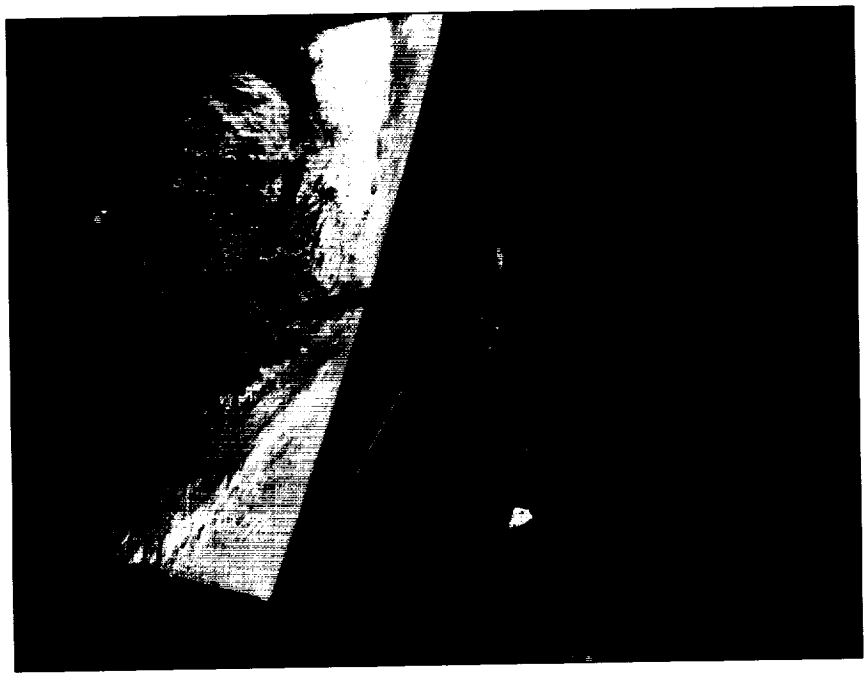
Accomplishments and Performance Measures

International Space Station

FY 1999 was a proud and successful year for the ISS program. The United States and its international partners (Canada, Europe, Japan, and Russia) made significant progress in the design and development of the ISS. In FY 1999, HEDS began its assembly. The U.S.-owned, Russian-built Zarya Functional Cargo Block was successfully launched and delivered to orbit in November 1998, and the U.S.-built Unity Node followed two weeks later and mated with Zarya. See "Mating of Zarya and Unity."

The first ISS logistics mission was completed in May 1999, delivering almost 2 tons of supplies and equipment, which will be needed to operate and live on the ISS. The program completed the early phases of the Multi-Element Integrated Test (MEIT) with several ISS elements, including the U.S. Laboratory Module, to successfully demonstrate overall hardware and software compatibility and physical integration. See "The U.S. Laboratory Module."

At the close of FY 1999, the on-orbit vehicle was approaching 10 months of service with most on-orbit systems operating at or above design specifications. While launching and maintaining on-orbit operations, the program continued to deliver all major flight hardware. The ISS program also successfully demonstrated its lead mission management responsibility, continuing the excellent level of cooperation between the United



Mating of Zarya and Unity

States and Russia that was established during the Shuttle-*Mir* program.

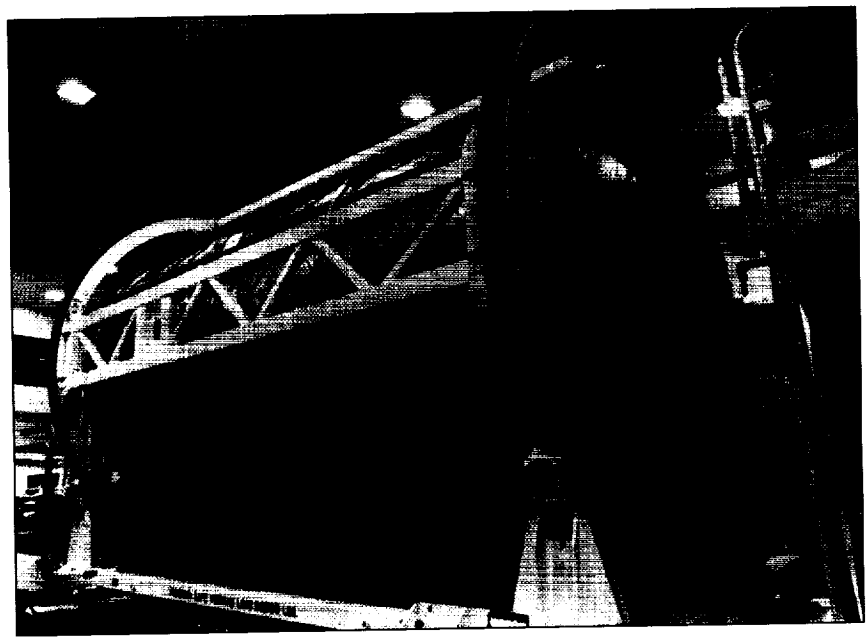
FY 1999 included substantial progress toward obtaining commitment to commercial investment in the ISS. HEDS developed policy recommendations leading to a White House legislative initiative to establish an ISS Commercial Demonstration Program. NASA expects to announce the first commercial projects within the Space Station Commercial Development program in FY 2000.

Although great progress was made during FY 1999, several ongoing issues continued to constrain the program. Russian funding shortfalls delayed the Service Module delivery to its launch site and are likely to continue to impact the Russian ground infrastructure, spares and sustaining engineering, and Soyuz and Progress vehicle availability. ISS contingency planning includes near-term plans to augment Russian propulsion and logistics capabilities with the Space Shuttle and the preparation of the Interim Control Module for launch-on-need reboost and attitude control.

Space Shuttle

The Space Shuttle program goal is to provide safe, reliable, and affordable access to space. The Shuttle is the only U.S. vehicle that provides human transportation to and from orbit. The priorities of the Space Shuttle program are to: (1) fly safely, (2) meet the flight manifest, (3) improve mission supportability, and (4) continuously improve the system. HEDS supported four Space Shuttle launches in FY 1999 while accomplishing several important improvement milestones for the Shuttle fleet:

- STS-95 carried a pressurized module for conducting laboratory research as its primary payload. Some mission records included: first flight of three Block IIA main engines, first flight test using space-to-space communications, and Senator John Glenn's Space Shuttle mission (oldest astronaut to fly at 77 years and 4 months), studying the effects of age and weightlessness. See "Astronaut John H. Glenn, Jr., in His Spacesuit in 1961 and Preparing for His Return to Space in 1998 as Part of the STS-95 Crew."



The U.S. Laboratory Module

Astronaut John H. Glenn, Jr., in His Spacesuit in 1961 and Preparing for His Return to Space in 1998 as Part of the STS-95 Crew

- **STS-88 was the first U.S. launch of ISS hardware, the Unity Node. The crew deployed the Node and mated it to the Russian-launched Zarya module.**
- **STS-96 delivered supplies and conducted a checkout of the ISS on orbit. See "STS-96 Launch."**
- **STS-93 launched and deployed the Chandra X-ray Observatory, designed to observe x-rays from high-energy regions of the universe, such as hot gas in the remnants of exploded stars. See "Chandra X-ray Observatory." The nearly 50,000-pound payload was the heaviest payload ever launched by a Space Shuttle. This flight was also the first flight of a female Commander, Eileen Collins. See "Mission Commander Eileen M. Collins on the Forward Flight Deck on STS-93."**

The Space Shuttle program continued to make great strides toward the privatization of operations under the Space Flight Operations Contract. Contributing to the ability of the contractor to achieve program goals with a reduced workforce (decreased from 1,973 to 1,883 in FY 1999) is the implementation of improvements and efficiencies to the Space Shuttle through its upgrade program. During FY 1999, the Space Shuttle upgrade program accomplished many significant improvement milestones for the Shuttle fleet, including the upgrading of *Atlantis* with a "glass" cockpit and the continued development of the high-pressure turbo fuel pump and the Checkout and Launch Control System. This new system, designed and being built "in-house," will replace Shuttle control room systems with state-of-the-art commercial equipment and software, thereby assuring that sound, safe, and efficient practices and processes are in place for privatized launch site processing.

Life and Microgravity Research

HEDS seeks to take advantage of the microgravity environment to pursue research questions in biology, chemistry, physics, and technology. Microgravity enables groundbreaking new research in systems ranging from cells to flames. In FY 1999, the HEDS Office of Life and Microgravity Sciences and Applications concentrated on taking advantage of available opportunities during ISS assembly to develop and prepare the scientific community for the era of ISS research. Despite difficult budget constraints, HEDS has increased the number of investigations it supports by more than 7 percent to about 850, without significantly reducing the average size of grants awarded.

The 1-year anniversary of the major Neurolab Space Shuttle mission was observed in FY 1999 with a symposium

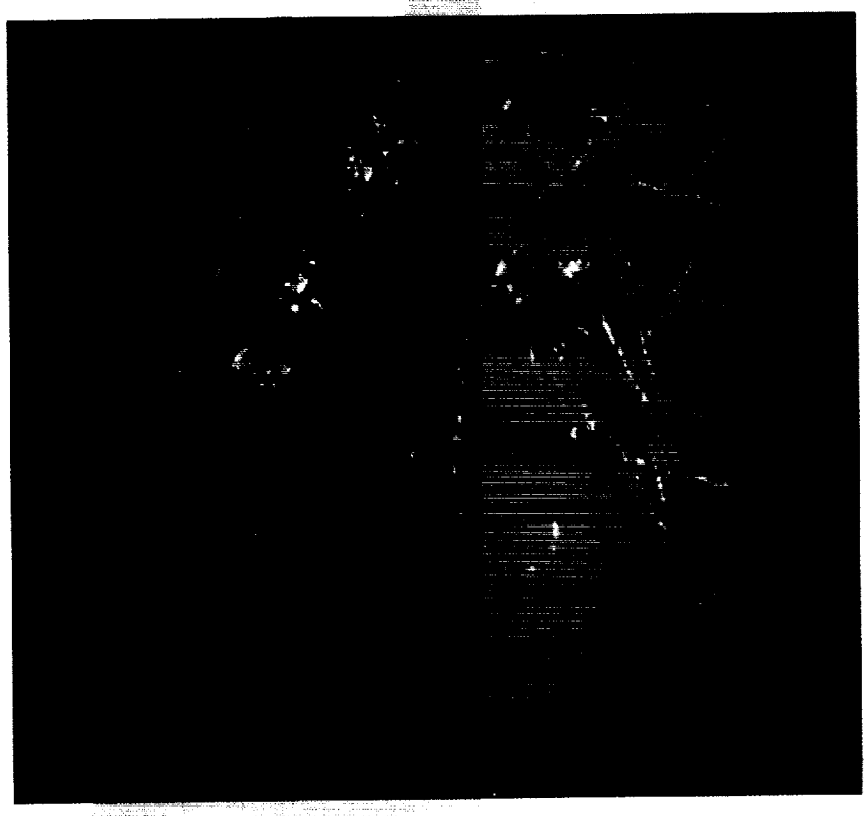
Mission Commander Eileen M. Collins on the Forward Flight Deck on STS-93

Above: Chandra X-ray Observatory
Background: STS-96 Launch

on findings and results. The Neurolab results confirm and expand previous space flight data, suggesting that the vestibular system (the system that senses gravity, maintains balance, and helps regulate movement control) undergoes significant remodeling in response to microgravity. Results from Neurolab include the observation that cells in the cerebral cortex of fetal mice divided more rapidly in space than on Earth. Neurolab data disprove a longstanding hypothesis on the way the brain interprets acceleration in the microgravity environment. Prior to Neurolab, it was widely believed that accelerometers in the inner ear reinterpret signals so that tilting the head is perceived as linear motion in microgravity.

HEDS researchers produced a number of important findings in FY 1999. Among the highlights in the physical sciences are new findings in fluid physics based on a colloidal system of hard spheres used to model materials structures. When carried to orbit, this classic model system has displayed new and unanticipated properties, and these findings may lead to a better understanding of materials formation. In microgravity, the system shows a dendritic growth pattern that is similar to growth patterns of crystals in solidifying metal on Earth. Because these growth patterns play a major role in determining properties such as strength and flexibility in metals, new models for predicting and describing this process may lead to improved industrial processes on Earth.

As part of a continuing effort in the application of NASA technologies to telemedicine, a Virtual Collaborative Clinic was held at Ames Research Center. Physicians and technical staff at multiple remote sites interacted in real time with three-dimensional visualizations of patient-specific data using next-generation high-bandwidth networks. Medical visualizations were a stereo reconstruction from a scan of a heart with a graft; stereo dynamic reconstructions (beating heart) of echocardiograms with Doppler effects and three-dimensional virtual jaw surgery using our CyberScalpel for irregular-shaped or round bones and organs. See "Stereo Reconstruction of a Heart."



Stereo Reconstruction of a Heart

In biotechnology, researchers have documented the surprisingly strong effect gravity has on the expression of genes. Substantial and unexpected differences in gene expression between flight and ground cell culture samples were found.

As recent events on the *Mir* Orbital Station have shown, spacecraft fire safety is critical for long-duration space flight. Spacecraft fire safety data were verified through cooperative U.S.-Russian *Mir* experiments. The flammability of selected U.S.-supplied plastic materials was tested under microgravity conditions in a Russian-supplied combustion tunnel operated on the *Mir* Orbital Station. The data were compared to reference testing of the flammability, heat release, thermal properties, and combustion products of identical materials in ground laboratories at both the Russian Keldysh Research Center and the Johnson Space Center's White Sands Test Facility.

Commercial Research

The HEDS Space Product Development program works in partnership with industry through 14 Commercial Space Centers representing more than 100 affiliated companies and institutions. The program facilitates access to space for commercially sponsored research to bring the opportunities for new advances, technological understanding, products, and jobs. Some highlights of this work include:

- The production of the antibiotic actinomycin D—used in conjunction with cancer treatments—by microorganisms was 75 percent higher in microgravity than in comparable ground control experiments, providing Bristol-Myers Squibb, the industry partner of BioServe, with new insights that may improve ground-based production.
- Technology for creating high-temperature superconducting wires—which will reduce the size of transformers, increase efficiency, and make them more environmentally friendly by eliminating the need for oil cooling—using oxide thin films has been licensed by Metal Oxide Technologies from the Space Vacuum Epitaxy Center, which developed the technology in cooperation with the Texas Center for Superconductivity.
- A gene transfer experiment by Rapigen and its partners showed that microgravity provided at least a tenfold increase in the successful transfer of traits to soybean seedlings over ground-based 0.1-percent success rates—especially important given that the U. S. Department of Agriculture estimates that more than 70 percent of the soybeans planted in the United States are of genetically engineered varieties.

Space Operations

The phase-in of the Consolidated Space Operations Contract (CSOC) to manage the Agency's space operations activities was completed in December 1998. The CSOC covers all of NASA's data collection, telemetry, and communication operations supporting its Earth-orbiting satellites, planetary exploration, and human space flight activities. The contract consolidates management responsibility from five NASA Centers to a single entity, an unprecedented step for a change of this magnitude. Cost performance is on track, customer operations are meeting proficiency targets, and workforce reductions are being effected consistent with the plan. This contract is expected to save taxpayers approximately $1.4 billion over 10 years.

Outreach and Education

One of the objectives of HEDS is to involve citizens in the adventure of exploring space and transfer knowledge and technologies to enhance the quality of life on Earth. During FY 1999, HEDS continued to sponsor a variety of programs and initiatives that support the Agency's Education Plan

and are in line with the National Education Goals to improve math and science literacy.

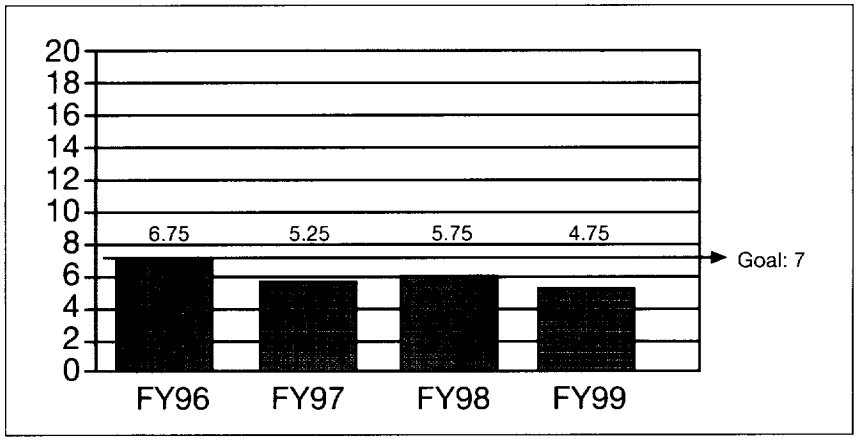
Specific education projects, such as EarthKam and SAREX, directly involve students in Shuttle flights. Students (K–12) had the opportunity to participate with researchers in the analysis and interpretation of research data. HEDS will continue to create a wonderment and excitement in students in the future through educational programs conducted through the ISS.

HEDS developed and operated an online project called Space Team Online (STO). This project focuses on the people behind the scenes who make the Shuttle fly and uses the Internet to connect primarily K–12 students with NASA's exciting Shuttle team. The purpose of STO is to motivate students toward math, science, and technology studies while demonstrating the variety of skills and educational backgrounds required to make the Shuttle program fly. Thousands of classrooms made use of STO.

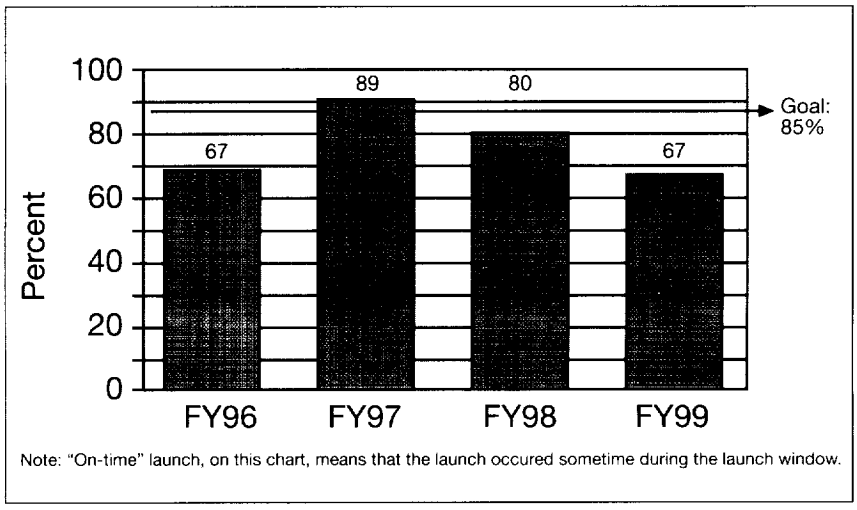
Space Shuttle Safety, Reliability, and Efficiency Performance Measures

Improving Space Shuttle safety and reliability is indicated by a reduced rate of in-flight anomalies, increased on-time success for launches, and reduced time required for mission preparation. The goal of this performance measure is to sustain Space Shuttle operations by safely flying the manifest (scheduled missions) and aggressively pursuing a systems upgrade program that will reduce payload-to-orbit costs. This Enterprise objective directly supports the Agency goal of improving Space Shuttle efficiency, while achieving mission goals and transitioning to private-sector operations as appropriate. Specifically, the HEDS Enterprise sought to achieve the following targets for 1999:

- Achieve seven or fewer flight anomalies per mission
- Achieve 85 percent on-time, successful launches (excluding the risk of weather)
- Reduce manifest preparation to 13 months



Space Shuttle In-Flight Anomalies per Mission



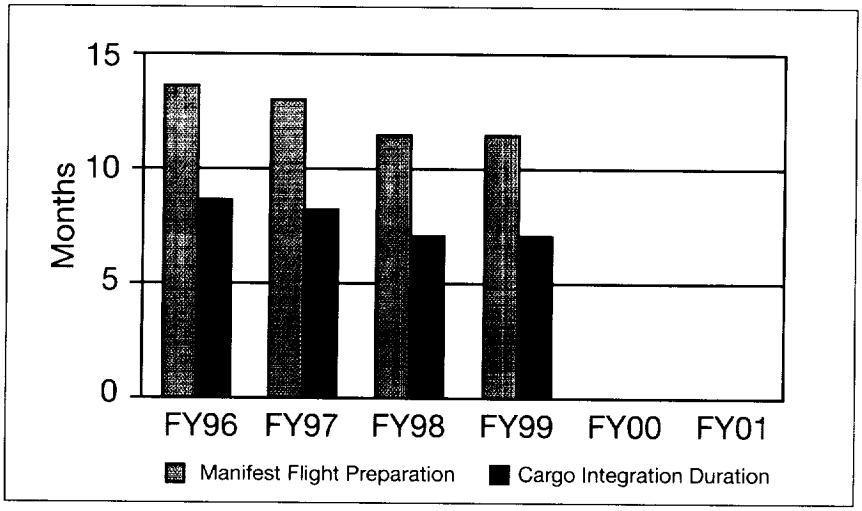
Space Shuttle On-Time Success Rate

In FY 1999, an average rate of 4.75 orbiter in-flight anomalies was observed. See "Space Shuttle In-Flight Anomalies per Mission." An on-time launch rate of 67 percent was observed. See "Space Shuttle On-Time Success Rate." Launch delays were called to assure a safe launch and the successful completion of the mission. While the target was not met, we did meet the intent of the strategic objective, which is to safely fly each mission. A 12-month flight preparation cycle and an 8-month cargo integration duration were achieved. See "Space Shuttle Manifesting and Cargo Integration Time."

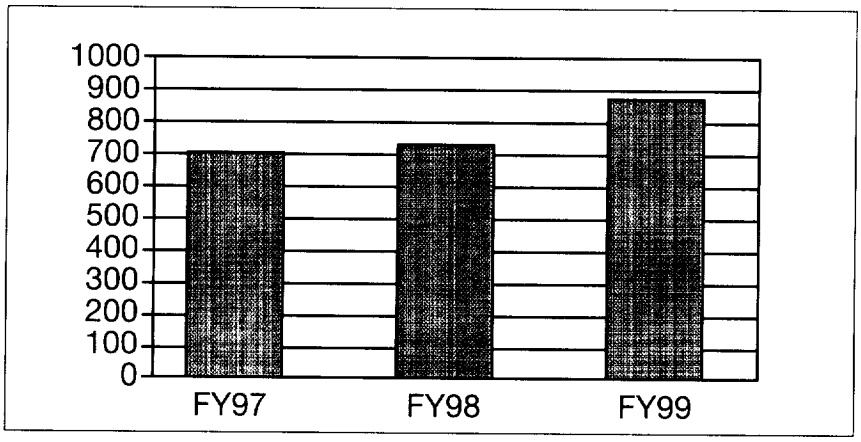
Scientific Investigations Funded Performance Measure

HEDS is actively developing a community of researchers to explore fully the role of gravity in physical, chemical, and biological processes and to maximize the scientific return from HEDS assets. The near-term objective is to expand scientific knowledge by exploring the role of gravity and the space environment in physical, chemical, and biological processes through a vigorous peer-reviewed research program in space and enabling the research community to use gravity as an experimental variable. This Enterprise objective directly supports the Agency's goal to "explore the role of gravity and the space environment in physical, chemical, and biological processes." An expanded research program funded about 850 investigations in FY 1999, an increase of more than 7 percent over FY 1998 as reported by the Lead Centers. See "Funded Investigations."

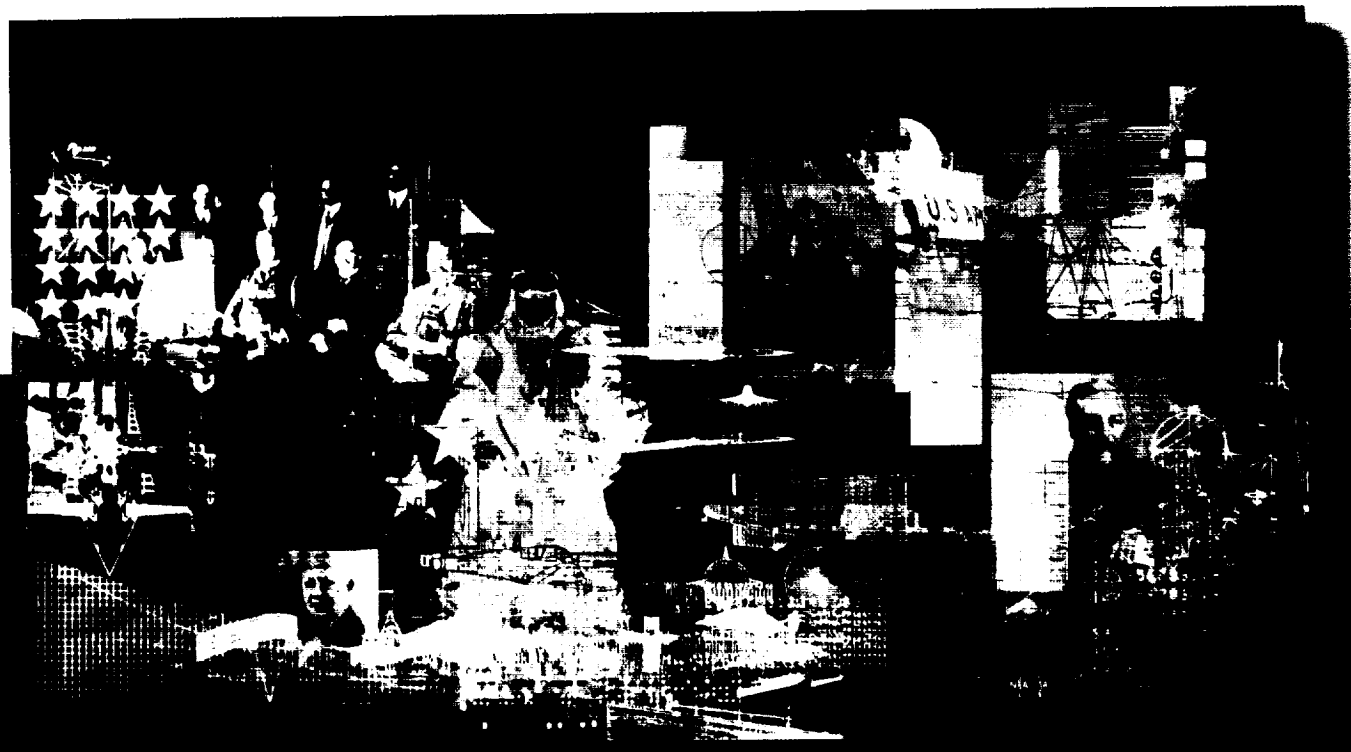
These target performances were verified and validated with data from the Program Management Council Space Shuttle Program Quarterly Status Reviews and by documentation from Space Shuttle Program Requirements Control Boards.



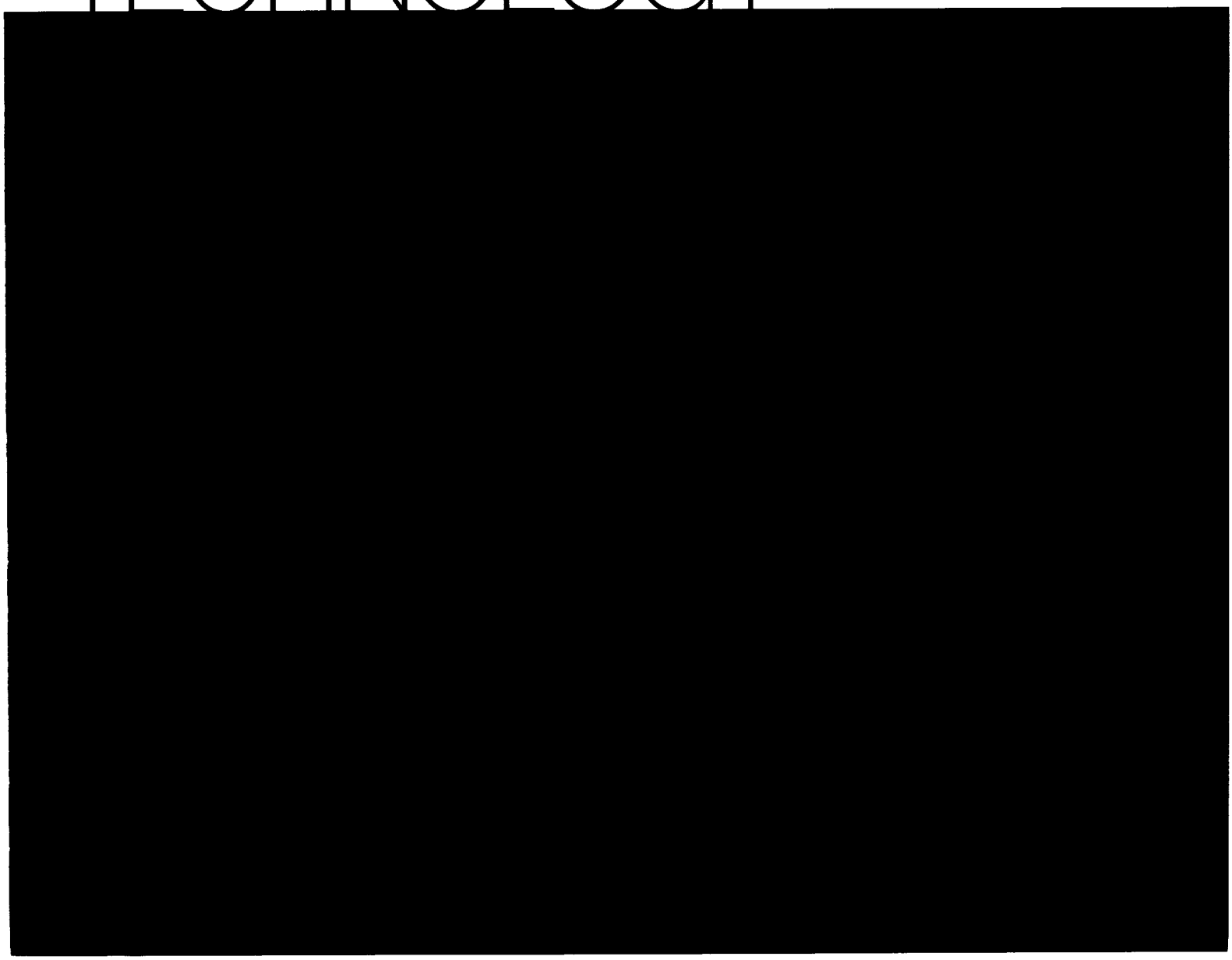
Space Shuttle Manifesting and Cargo Integration Time



Funded Investigations



AERO-SPACE TECHNOLOGY



Mission and Questions

Research and technology play a vital role in ensuring the safety, environmental compatibility, and productivity of the air transportation system and in enhancing the economic health and national security of the Nation. However, numerous factors, including growth in air traffic, increasingly demanding international environmental standards, an aging aircraft fleet, aggressive foreign competition, and launch costs that impede affordable access and the utilization of space, represent formidable challenges to the Nation.

The mission of the Aero-Space Technology Enterprise is to pioneer the identification, development, verification, transfer, application, and commercialization of high-payoff aerospace technologies. Through its research and technology accomplishments, it promotes economic growth and national security through a safe, efficient national aviation system and affordable, reliable space transportation. The plans and goals of the Enterprise directly support national policy in aerospace, documented in "Goals for a National Partnership in Aeronautics Research and Technology" and "National Space Transportation Policy." The Enterprise works in alliance with its aerospace customers—including U.S. industry, the university community, the Department of Defense (DOD), the Federal Aviation Administration (FAA), and the other NASA Enterprises—to ensure that national investments in aerospace technology are effectively defined and coordinated and that NASA's technology products and services add value, are timely, and have been developed to the level at which the customer can confidently make decisions regarding the application of those technologies.

The Enterprise also has responsibility for technology transfer and commercialization. This function is provided as an Agencywide service to ensure the wide, rapid transfer of NASA-developed technologies to U.S. industry for the social and economic benefit of all citizens.

The Enterprise addresses the following fundamental question:

- How can we enable revolutionary technological advances to provide air and space travel for anyone, anytime, anywhere more safely, more affordably, and with less impact on the environment and improve business opportunities and global security?

Goals and Objectives

The Aero-Space Technology Enterprise has three goals (pillars) supported by 10 enabling technology objectives that address the critical aerospace needs of our Nation. The goals and objectives are stated as "outcomes," or what the "world as we know it" could be like if the goals are achieved. In addition, the Enterprise has a service goal. These goals are as follows:

- **Pillar One: Global Civil Aviation** will develop an environmentally friendly global air transportation system for the next century of unquestioned safety that improves the Nation's mobility. Pillar One is supported by enabling technology objectives that address challenges in Aviation Safety, Emissions Reduction, Noise Reduction, Aviation System Capacity, and Affordable Air Travel.
- **Pillar Two: Revolutionary Technology Leaps** will revolutionize air travel and the way in which aircraft are designed, built, and operated. Pillar Two is supported by enabling technology objectives that address challenges General Aviation Revitalization and Design Tools and Experimental Planes.
- **Pillar Three: Space Transportation** will achieve the full potential of space for all human endeavor through affordable space transportation. Pillar Three is supported by enabling technology objectives that address challenges in Low-Cost Space Access and In-Space Transportation.
- The **Service Goal** will (1) enable, and as appropriate provide, on a national basis, world-class aerospace research and development services, including facilities and expertise, and (2) create alliances with industry to develop technology systems and transfer NASA technology.

Accomplishments and Performance Measures

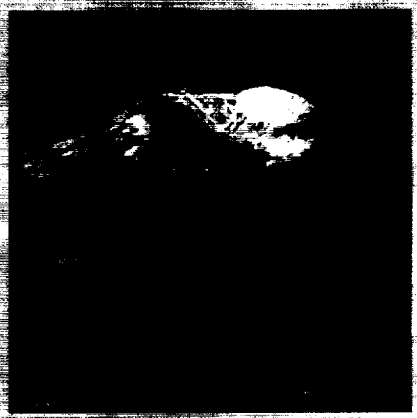
The Enterprise produced many exciting accomplishments in support of its goals and objectives. These accomplishments will directly benefit the American people through safer, more affordable and more environmentally friendly air travel and more efficient and affordable access to space. A few accomplishments, organized by goals and objectives of the Enterprise, are highlighted here.

Pillar One: Global Civil Aviation

Aviation Safety: *Reduce the aircraft accident rate by a factor of 5 within 10 years, and by a factor of 10 within 25 years.*

Controlled Flight into Terrain (CFIT): More than 30 percent of all fatal accidents worldwide are categorized as CFIT accidents, in which a functioning aircraft impacts terrain or obstacles the flight crew were unable to see. As part of the Airframe Systems Program, several underlying causes of CFIT were identified, and 13, 2- to 3-year contracts were awarded to develop and demonstrate approaches for fully operational and certifiable synthetic vision (7 awards) and health management (6 awards) systems. Preparation for the flight evaluation of a crew-centered synthetic vision display was also completed, as was a study of synthetic vision applicability to general aviation aircraft. See "Synthetic Vision Display."

Supercooled Large Droplet Icing Flight Test: Under the Aviation Operations Systems Program, Glenn Research Center's Twin Otter Icing Research Aircraft completed flight tests for the 1998–1999 winter icing season with high-fidelity icing cloud instrumentation mounted underside its wing. In combination with instrumentation comparison testing from Glenn's Icing Research Tunnel conducted in November 1998, this database provides enhanced knowledge of ice formation processes. Because of the wealth of data gathered, reduction and analysis were 70 percent complete at the end of FY 1999, with the remainder completed by the end of the calendar year. Both activities were a cooperative effort with Atmospheric Environmental Services of Canada and the FAA to improve understanding of severe icing hazard, and thus enhance aviation safety.



Synthetic Vision Display

Emissions Reduction: *Reduce emissions of future aircraft by a factor of 3 within 10 years, and by a factor of 5 within 25 years.*

Fifty Percent NO_x Reduction Low-Emission Combustor As part of the Advanced Subsonic Technology Program, a low-emission combustor was demonstrated on a Pratt & Whitney 4000 development engine. The low-emission combustion concept utilizes initially rich front-end combustion followed by air-quench and lean combustion. The engine was operated over [illegible] normal operating envelope with [illegible] conventional and low-sulfur fuel and [illegible] included limited combustor operability and durability assessment. The results included reductions in nitrogen oxide (NO_x) levels during the landing and takeoff cycle, reductions in carbon monoxide and unburned hydrocarbon levels, and comparable reductions in cruise NO_x emissions.

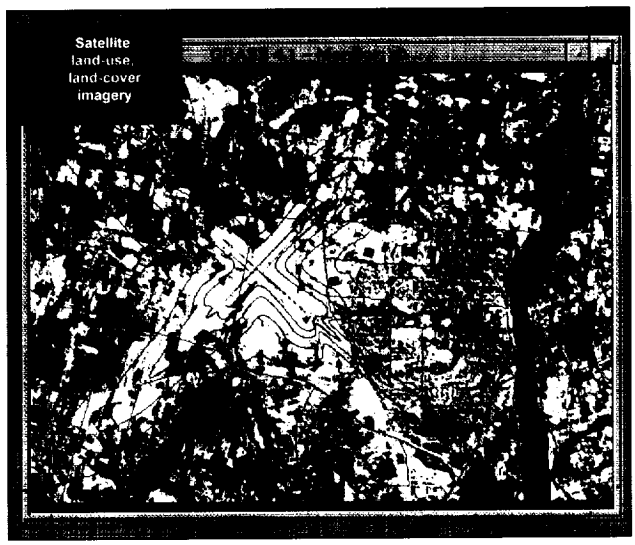
Noise Reduction: *Reduce the perceived noise levels of future [illegible] by a factor of 2 from today's [illegible] aircraft within 10 years [illegible] tor of 4 within 20 years.*

Prediction and Mit[illegible] dology for Contemporary Advanced prediction methods [illegible] ational procedures to reduce co[illegible] ty noise are required to meet [illegible] 25-year Enterprise noise reduction

The Advanced Subsonic Technology Program's Aircraft Noise Impact Model combines airport noise prediction, census data, and satellite imagery into a Geographical Information System. The model optimizes ground tracks and trajectories for minimized impact and validates the need for improvement at long range. Improved high-lift systems, in combination with advanced operational procedures, have the potential to reduce community source noise impact by 2–4 decibels. See "Airport Noise Impact."

System Capacity: ***While [illegible] triple the aviation [illegible] in all weather [illegible] 10 years.***

[illegible] System [illegible] System [illegible] development [illegible] version 2 [illegible] and integrated shell. New [illegible] wake prediction and ground effect), [illegible] tracking algorithms, derived wake resistance [illegible] improved weather [illegible] for several runway [illegible] version 2 [illegible] labo[illegible] Center [illegible] the Dallas-



Airport Noise Impact

Affordable Air Travel: *Reduce the cost of air travel by 25 percent within 10 years, and by 50 percent within 20 years.*

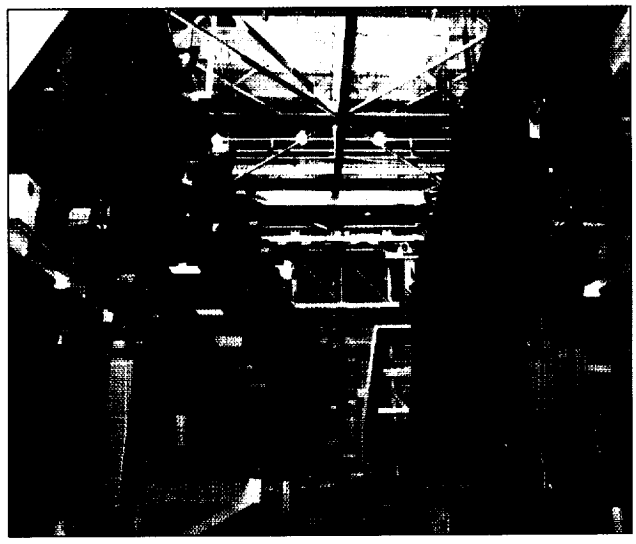
Stitched Composite Semi-Span Wing Assembly: The assembly of the semi-span wing test article represents a key milestone on the way to verification of the cost (20 percent) and weight (25 percent) reduction goals of the Advanced Subsonic Technology Program. Stitched composite upper and lower cover panels were fabricated, inspected, and installed in the assembly fixture, along with nearly all of the composite internal substructure (ribs and spars). The as-fabricated net shape of the one-piece integral cover panels was excellent and represents the largest stitched parts ever fabricated (42 feet in length). The integral, net-shape fabrication leads to precision assembly with minimal postfabrication machining and shimming, which contributes to the overall cost reduction. Performance verification at Langley's full-scale structural test facility was also initiated in FY 1999. See "Semi-Span Wing Components Being Installed in the Wing Assembly Fixture."

Pillar Two: Revolutionary Technology Leaps

General Aviation: *Invigorate the general aviation industry, delivering 10,000 aircraft annually within 10 years, and 20,000 aircraft annually within 25 years.*

General Aviation Propulsion: Though slowed by technical problems, progress continued during FY 1999 in NASA's cooperative efforts with industry to develop advanced engine technology for general aviation aircraft. Both the advanced internal combustion engine and the small gas turbine engine completed assembly as well as initial performance and operability testing. Design modifications to correct problems uncovered during the ground-based tests were completed and incorporated in the their respective rebuilds, with testing scheduled to begin again in early 2000. In both cases, confidence remains high in the potential to demonstrate both the internal combustion and turbine engines on experimental aircraft at the Summer 2000 Oshkosh Fly-In in Wisconsin.

AGATE Prototype Systems Evaluated and Downselected for Integrated Testing: Under the Advanced Subsonic Technology Program, final systems have been downselected for future integration into an Advanced General Aviation Technology Experiment (AGATE) aircraft. The prototype systems include an AGATE Intuitive Pilot Interface and improved structural materials. The Intuitive Pilot Interface (the "Highway in the Sky"), in concert with a multifunctional display, is being developed to provide a pilot with a graphic depiction of a desired flight path, taking into account weather, traffic, terrain,



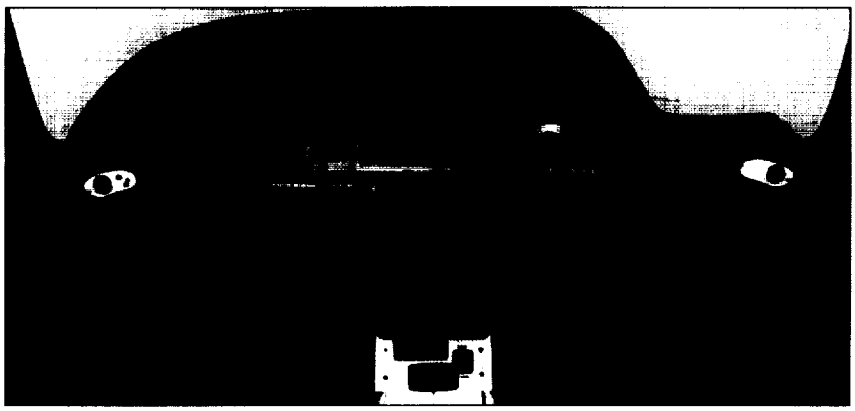
Semi-Span Wing Components Being Installed in the Wing Assembly Fixture

and any airspace issues without the use of voice communications. The prototype system will lead to increased safety, improved situational awareness, and reduced operational workload. NASA has led an effort to define the epoxy-based composite material qualification methodology. The FAA has published the final guidelines for these materials. This has resulted in a substantial reduction in certification cost and certification time. See "AGATE Prototype Systems."

Design Tools and Experimental Planes: *Provide next-generation design tools and experimental aircraft to increase design confidence, and cut the development cycle time for aircraft in half.*

Full Combustor Simulation Demonstrates Improvement in Design Time and Cost: In September 1998, the High Performance Computing and Communications Program achieved a 200:1 reduction in turnaround time (3,174 hours on the Intel Paragon or 13 hours on a Silicon Graphics Origin 2000) on a full combustor simulation from compressor exit to turbine inlet. In June 1999, the reduction turnaround time improved to 307:1 and, by year end, was at 320:1 (10 hours on Silicon Graphics Origin 2000). This improvement in the National Combustor Code will contribute to a significant reduction in aircraft engine combustor design time and cost by reducing the need for combustor rig testing by one-third, resulting in a savings estimated at $2 million. This also aids in accomplishing the national goal to reduce aircraft engine emissions.

Remotely Piloted Aircraft (RPA) to 55,000 Feet for 4-Hour Duration: In July 1999, the Flight Research Program conducted an RPA flight demonstration of Altus (General Atomics ERAST vehicle) at Edwards Air Force Base. The purpose of the demonstration was to validate RPA technology for use in science missions of greater than 4 hours duration in



AGATE Prototype Systems

deployment to areas such as the polar regions above 55,000 feet. The flight demonstration was a success and further increases design confidence in the application of RPA's as science measurement platforms. See "Altus in Flight."

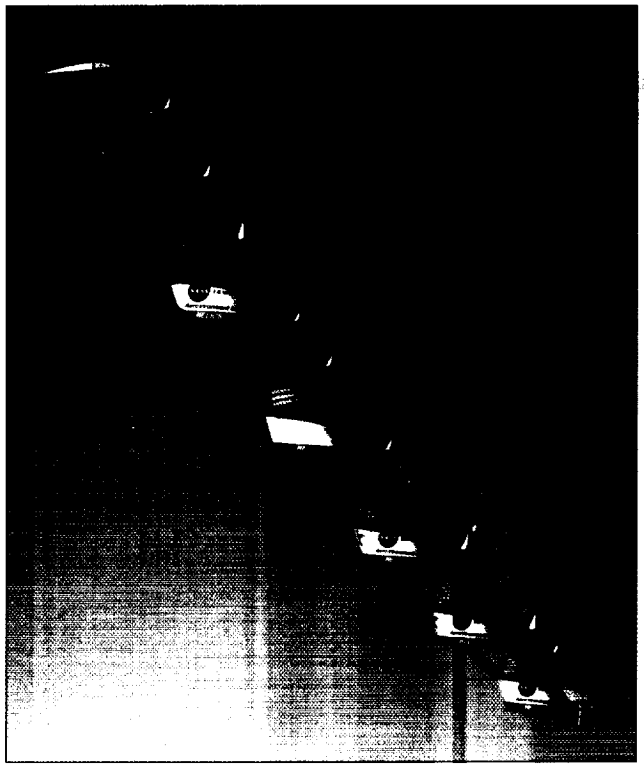
Helios First Flight: The Flight Research Program also completed the first low-altitude flight of a Helios prototype in September 1999. The flight demonstration included a battery-powered, remotely piloted vehicle aircraft with a wingspan greater than 245 feet, suitable for flight to 100,000 feet in altitude or a duration of 100 hours once outfitted with high- performance solar cells. Based on the excellent results from these flights, the procurement of advanced solar cells will be initiated during 2000. See "Helios Flight."

Pillar Three: Space Transportation

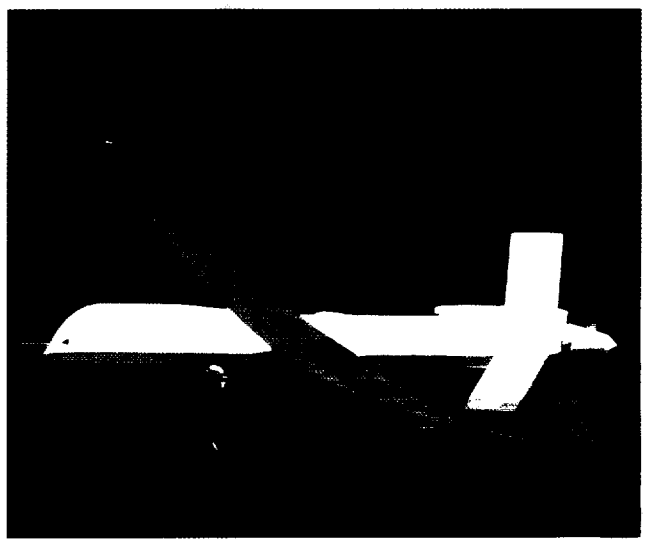
Low-Cost Space Access: *Reduce the payload cost to low-Earth orbit by an order of magnitude, from $10,000 to $1,000 per pound, within 10 years, and by an additional order of magnitude within 25 years.*

X-33 Aerospike Engine Development Testing: Testing of the first development Aerospike engine for the X-33 began during FY 1999 at Stennis Space Center. The second and third engines are the flight engines for the X-33 and were scheduled for acceptance tests at Stennis near the end of the calendar year. Unfortunately, the liquid hydrogen tank for the vehicle experienced a delamination following pressure and structural load testing at Marshall Space Flight Center in early November 1999. The evaluation of the situation and its impact to the program were initiated in December and will continue into early 2000.

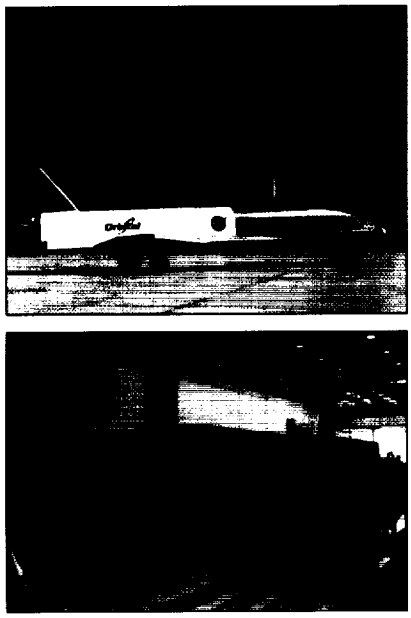
X-34 Vehicle Fabrication: Though slowed by hardware delivery problems and the resolution of environmental concerns at the White Sands test site, progress toward the first flight of the X-34 continued during FY 1999. Hot fire testing of the Fastrac engine was initiated at Stennis, and the build of the first powered flight vehicle (A-2) continued. The replanned program includes the modification of vehicle A-1 (used for captive-carry testing with the L-1011 launch aircraft) as an unpowered vehicle for testing at White Sands, with powered testing (using vehicle A-2) moved to Dryden Flight Research Center at Edwards Air Force Base.



Helios Flight



Altus in Flight



X-34 Flight Vehicles

Program replanning also includes a change in engine test sites from Stennis to Rocketdyne's facility in California. The first unpowered flight of the X-34 is now scheduled for April 2000. See "X-34 Flight Vehicles."

Rocket Based Combined Cycle (RBCC) Flowpaths: As a major step in the development of next-generation space transportation propulsion systems, and under the Advanced Space Transportation Program, a pair of hydrogen-fueled RBCC flowpaths have been ground tested. The flowpaths have been tested in all expected operating modes, and transition from air-augmented rocket to ramjet operating mode has been demonstrated in a new, unique facility that allows for the continuous variation of the simulated Mach number.

In-Space Transportation: *Reduce the payload cost of interorbital transfer by an order of magnitude and travel time for planetary missions by a factor of 2 within 15 years.*

Critical Design Review (CDR) of Propulsive Small Expendable Deployer System (ProSEDS): The Advanced Space Transportation Program held a Critical Design Review of the ProSEDS experiment in early September 1999, to review maturity of the system design. The experiment is scheduled for launch in August 2000, and it is intended to demonstrate the use of electrodynamic tethers as a means of propulsion in space without the use of propellants. See "Artist's Concept of ProSEDS Experiment."

The Aero-Space Technology Enterprise tracks programwide performance measures for its performance commitments and its customers' satisfaction.

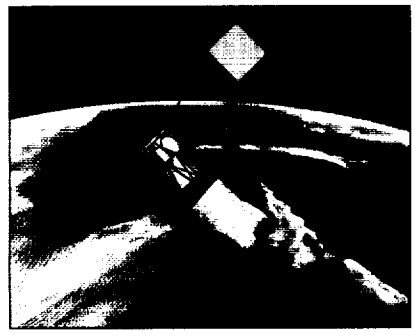
Aggregate Deliverables Completed as a Percentage of Planned Deliverables Performance Measure

Each Enterprise program uses measurable customer-negotiated product and service deliverables to track annual performance against plans, including specific success criteria for milestone completion assessment.

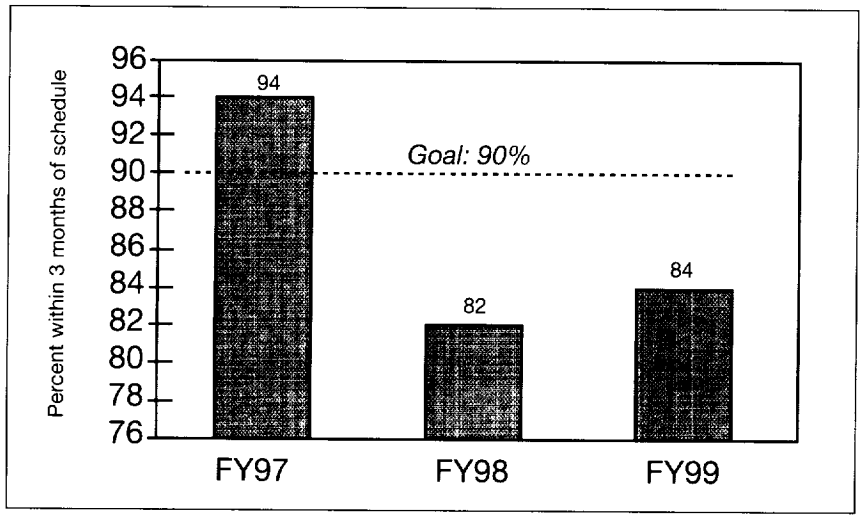
This metric aggregates the performance of individual program milestones to provide a composite indicator of progress toward the goals and objectives of the Enterprise. The Enterprise goal is to complete 90 percent of customer-negotiated product and service deliverables within 3 months of the established commitment date. The Enterprise completed 84 percent of its planned deliverables within the 3-month metric; 6 percent were completed 4 to 6 months late. See "Aggregate Deliverables Compared as Percentage of Planned Deliverables."

Satisfaction With Facility Use Performance Measure

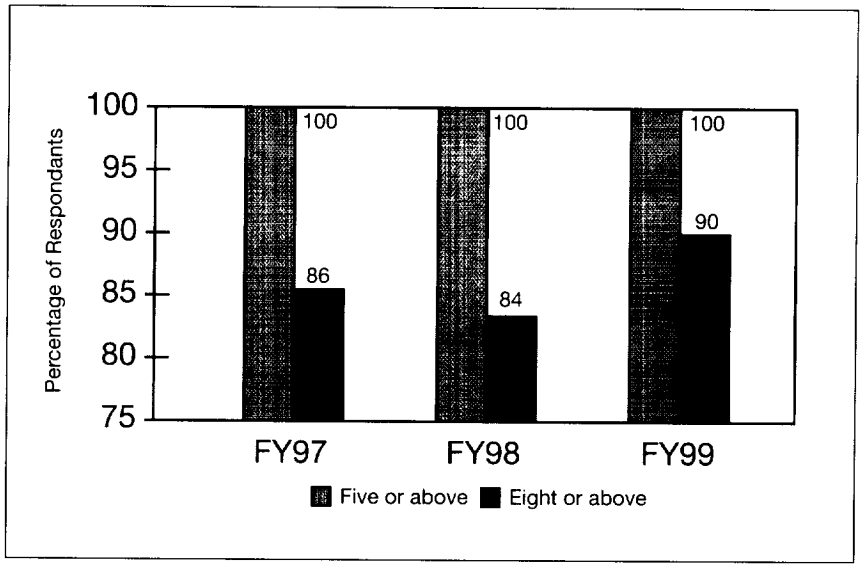
One of the major services provided by the Enterprise to its customers is



Artist's Concept of ProSEDS Experiment



Aggregate Deliverables Compared as Percentage of Planned Deliverables

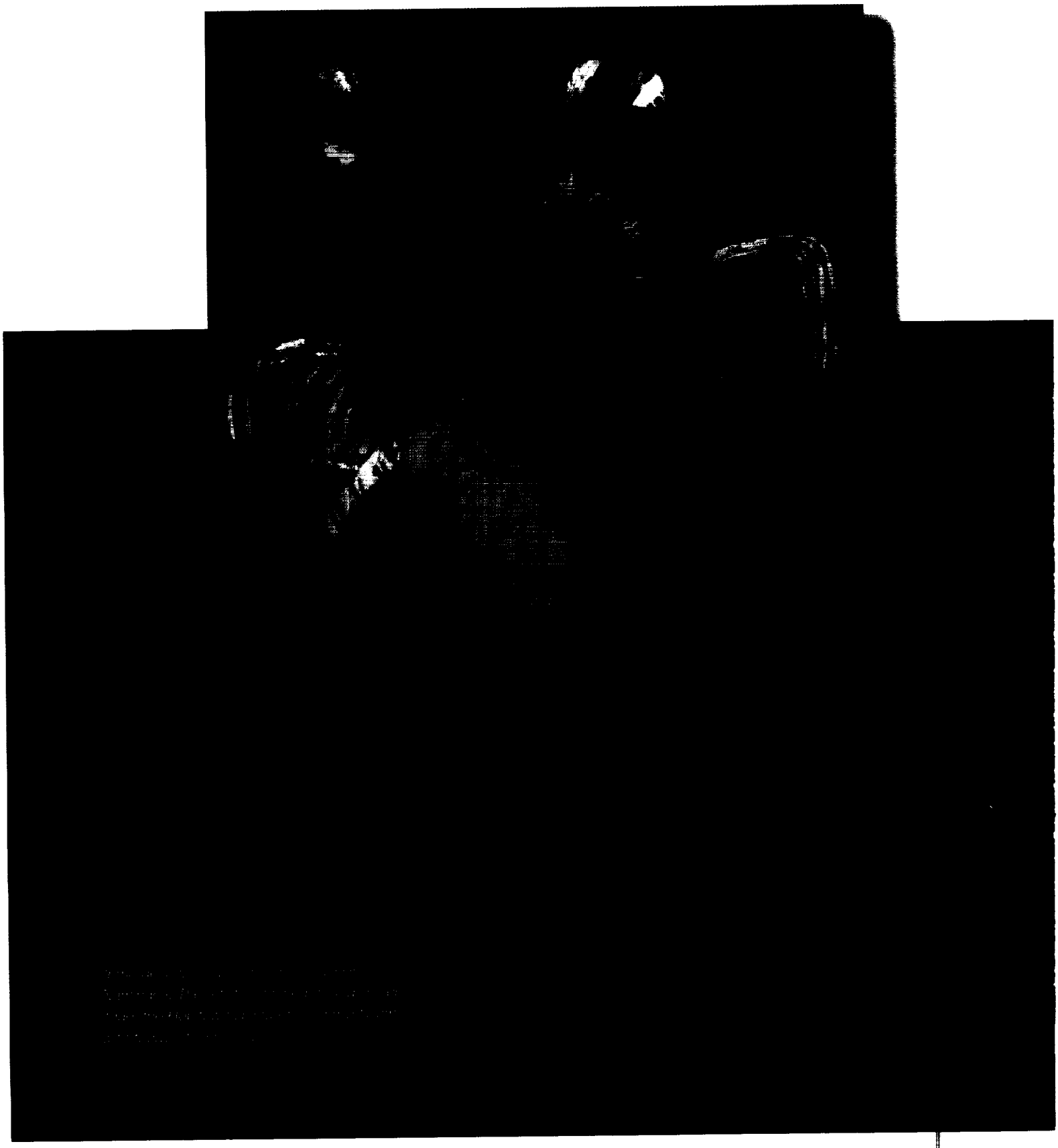


Facility Utilization Satisfaction

access to NASA's critical research and development facilities, such as wind tunnels. Each of the four NASA Research Centers (Ames, Dryden, Langley, and Glenn) conducts exit interviews at selected facilities. This metric aggregates the interview results to provide an overall indicator of customer satisfaction relative to the Enterprise research and development services goal. Facility-by-facility data are available and used to improve customer satisfaction.

The Enterprise metric is to have 80 percent of facility exit interview respondents rate satisfaction with aeronautics facilities at "8" or above (on a scale of 1 to 10) and to have 95 percent rate facilities at "5" or above. For FY 1999, the Enterprise exceeded both goals, scoring 100 percent and 90 percent, respectively. See "Facility Utilization Satisfaction."

With the exception of the survey and education outreach targets, the data used to substantiate actual performance originated at the NASA Field Center responsible for program implementation. The data were verified by senior officials at those Centers and also during the periodic Enterprise review process at NASA Headquarters, including the NASA Program Management Council on selected programs and projects. The above assessment was also reviewed by the Aero-Space Technology Committee of the NASA Advisory Council.



CROSSCUTTING MANAGEMENT ACTIVITIES

The work of the Agency's four Enterprises is supported by the following Crosscutting Processes:

- Manage Strategically
- Provide Aerospace Products and Capabilities
- Generate Knowledge
- Communicate Knowledge

Through these processes, we transform inputs, such as policies and resources, into outputs, such as knowledge.

Manage Strategically

The Manage Strategically process involves planning, direction, and oversight of Agency activities.

Mission and Goals

The mission of this process is to provide policy, direction, and oversight to the Strategic Enterprises, functional staff, and Centers to enable the accomplishment of programs. The goal is to provide a basis to carry out responsibilities effectively and safely and enable management to make critical decisions regarding implementation activities and resource allocations, while ensuring consistency with the goals, objectives, and strategies contained in its Strategic, Implementation, and Performance Plans. Through strategic management, NASA measures its performance and communicates the results, demonstrating their relevance and contribution to national needs.

Objectives

The objectives of the Manage Strategically process are to:

- Align direction and deployment decisions with external mandates

and the requirements of our customers, partners, and stakeholders
- Communicate direction and decisions throughout the NASA team and to the external community in a timely, consistent, and understandable manner
- Optimize investment strategies and systems to align human, physical, and financial resources with customer requirements, while ensuring compliance with applicable statutes and regulations
- Improve the effectiveness and efficiency of acquisitions through the increased use of techniques and management that enhance contractor innovation and performance
- Ensure that information technology provides an open and secure exchange of information, is consistent with our technical architectures and standards, demonstrates a projected return on investment, reduces risk, and directly contributes to mission success
- Foster leadership that demonstrates a commitment to our values, principles, goals, and objectives

Accomplishments and Performance Measures

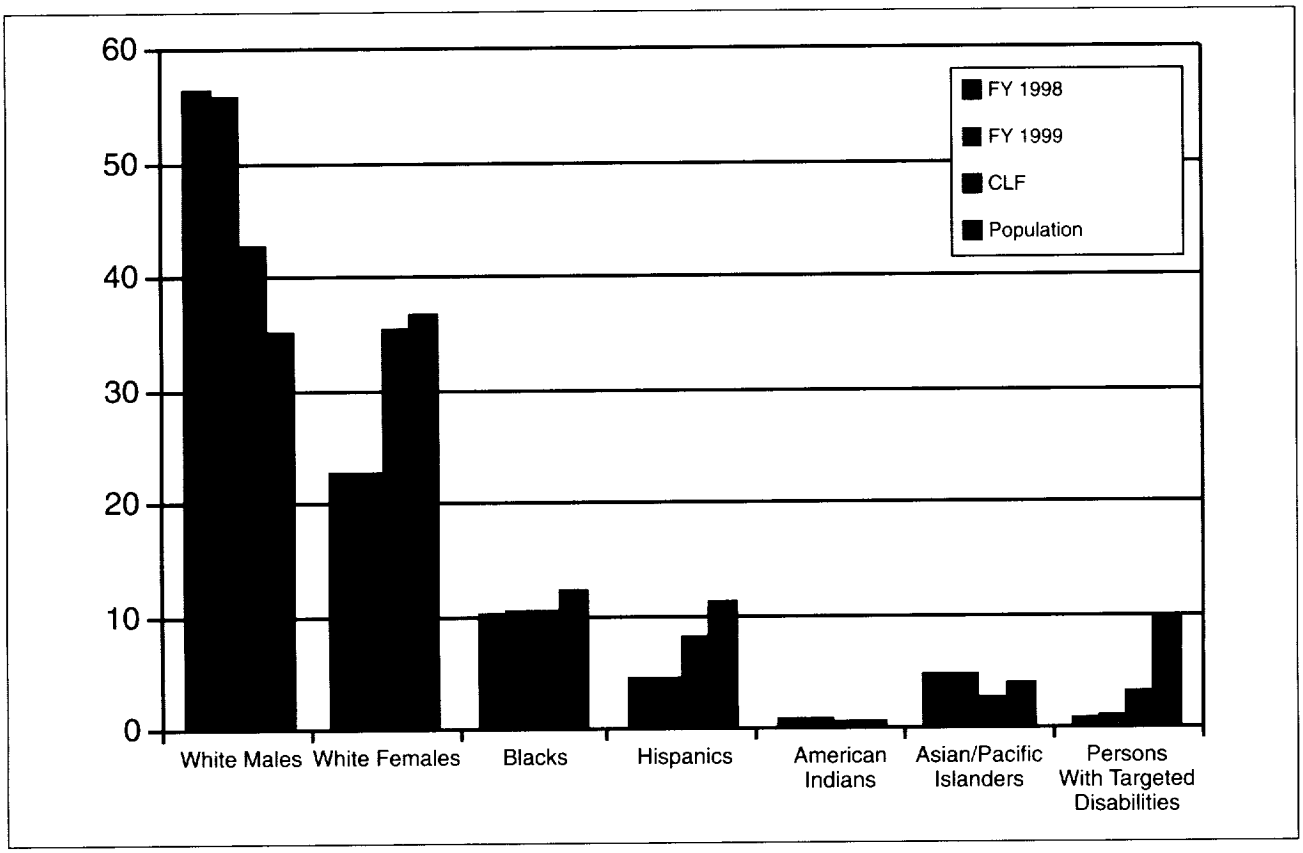
The accomplishments and performance measures for this process are summarized in several areas: Human Resources, Physical Resources, Procurement, Information Technology, and Financial Management.

Human Resources. NASA continued to carefully manage full-time equivalent (FTE) reductions to maintain program schedules and safe operations. These reductions were accomplished by voluntary losses, buyouts, intercenter transfers, and the restriction of outside hiring. At the same time, the Agency focused additional emphasis on refreshing and revitalizing the workforce via the implementation of development initiatives, such as the Program Management Development Process Accelerating Leadership Option (PMDP-ALO).

The PMDP-ALO, involving a strategic partnership between NASA and the Massachusetts Institute of Technology (MIT), is designed to provide technical program and project managers the opportunity to obtain systems perspective, gain hands-on experience, and develop the ability to perform insight duties in NASA aerospace endeavors, combined with a rigorous academic curriculum. Topics currently include systems design, safety/risk, and modeling, with future tracks in information technology and biological sciences. The PMDP-ALO blends the best of tailored practitioner experiences and academic learning to prepare future NASA technical program and project leaders in the system design of complex programs and sound business management practices.

Increase Workforce Diversity Performance Measure. NASA has made significant strides in diversifying its workforce at all levels. In addition, NASA takes great pride in its astronaut corps, which reflects the face of America. NASA is increasing workforce diversity by working toward a long-term goal that reflects the diversity of America and of the civilian labor force (CLF). The effort aligns human resources with external mandates and increases alignment with customer requirements. Since FY 1992, the percentage of minorities, women, and individuals with targeted disabilities has increased, while the total workforce size has decreased. See "Workforce Diversity."

Physical Resources. Through techniques such as principal centers, partnering, performance-based contracting, energy conservation, recycling, pollution prevention, and outsourcing, NASA has been able to increase its return on investments in its physical assets. Execution of a fully consolidated and integrated asset management system

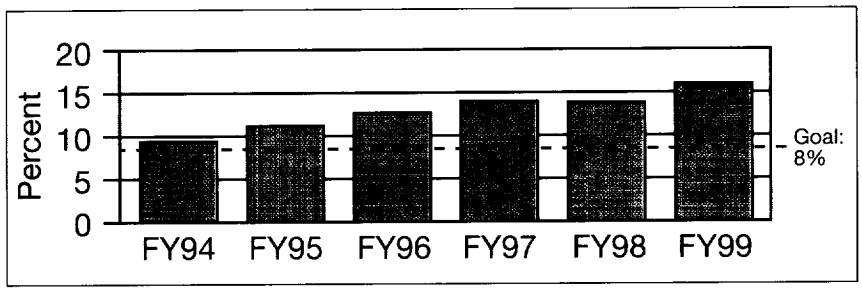


Workforce Diversity

that enables and supports full cost principles will maximize the value of physical resources management to its programs. Improvements in the knowledge and skills of the workforce facilitate the achievement of breakthrough results in functional management areas. These outcomes have been demonstrated through a cost avoidance indicator that shows that we exceeded the expected target by approximately 163 percent through proactive, efficient, and effective management of physical resource responsibilities. Indicators of improved facilities engineering, environmental management, and logistics management are validated by analyses of data obtained from Center reports, the NASA Environmental Tracking System database, and annual Personal Property Reports. Cost avoidance is a result of an action that avoids a potential greater future cost. It measures the effect of the following strategies: leasing reductions, maintenance initiatives, alternative investments, and facility closures; energy conservation, recycling, and pollution prevention initiatives; and acquisition of idle and excess property and exchange/sale allowance

proceeds returned to NASA to offset new procurement expenditures.

Procurement. NASA continues its activities to improve the efficiency and effectiveness of the procurement process and enhance contract management through improved systems and information for monitoring. For example, a new strategy for evaluating the efficacy of procurement operations has been implemented; it combines periodic Headquarters Office of Procurement onsite surveys of Centers with Center self-assessments and periodic International Organization for Standardization (ISO) audits. The procurement management survey teams review Centers triennially and validate contract management activities. As a result of the explosion of web technology, enhanced access to information, the work of the NASA Acquisition Internet Service (NAIS) Team in developing a range of tools for the contracting community, and the need to assimilate procurement activities with the Integrated Financial Management System (IFMS), the Office of Procurement began work in FY 1999 to establish the Virtual Procurement Office (VPO). The VPO, when completed, will assemble in one place on the Internet the myriad of references, tools, and sample documents available to contract specialists. The VPO will provide a convenient reminder of tasks that need to be accomplished and immediate access to the tools available to accomplish the tasks.



Funding to Small Disadvantaged Businesses as a Percentage of Agency Funding

The NASA Office of Procurement also worked closely with the Office of Safety and Mission Assurance to initiate a Risk-Based Acquisition Management (RBAM) initiative. RBAM will integrate risk and safety principles throughout the entire acquisition process by considering the implications of programmatic risk when developing acquisition strategy, selecting sources, choosing contract type, structuring fee incentives, and conducting contractor surveillance.

Funding to Small Disadvantaged Businesses Performance Measure. Achieving a percentage of 16.1, NASA exceeded its congressionally mandated goal of providing 8 percent of its annual funding to small disadvantaged businesses, including Historically Black Colleges and Universities, other minority educational institutions, and women-owned small businesses, via prime and subcontracts awarded in support of authorized programs. See "Funding to Small Disadvantaged Businesses as a Percentage of Agency Funding."

Information Technology. NASA's strategic focus areas for Information Technology (IT) are:

- Safety and Security
- Cost-Effective Common Infrastructure and Services
- Transfer of Innovative Technology Into the NASA Infrastructure

Safety and Security. NASA is committed to providing an exemplary IT security posture by aggressively reducing system vulnerabilities, training system and network administrators, and ensuring effective security plans for all mission-critical systems. IT security, infrastructure protection, and privacy of data are requiring more management attention and an increasing share of the IT budget. The Agency continued to implement a

comprehensive security program that addresses policy, training, incident response and reporting, auditing and monitoring, penetration testing, trust, and key security technologies. On an Agencywide level, implementation of a Public Key Infrastructure (PKI) has begun based on various pilots, which assessed the effectiveness of PKI cryptographic technologies. At Headquarters, network security improvements have been made in which aggressive data security policies have been established, a firewall infrastructure has been deployed and users have been migrated behind the firewall, and strong, industry-leading, cost-effective dial-in security mechanisms have been provided.

Aggressive actions were taken to ensure that missions, systems, and supporting infrastructure and facilities were not disrupted by the transition to the new millennium. The renovation of all mission-critical systems (MC) and nonmission-critical systems (NMC) and business continuity and contingency plans are complete, culminating in more than 3 years of analysis, extensive testing, and formal certification processes.

Cost-Effective Common Infrastructure and Services. As an early adopter of progressive business approaches for delivering common infrastructure and services, NASA continued to realize efficiencies through outsourcing and consolidation initiatives, as well as more optimum use of IT for Agencywide services. The Outsourcing Desktop Initiative for NASA (ODIN) and the outsourcing of NASA Integrated Services Network (NISN) support are examples of key initiatives that enabled efficiencies and improved business practices.

Technology is employed as a way to provide improved support at lower cost. For example, the NASA Automated Data Processing (ADP) Consolidation Center (NACC) upgraded its bipolar technology computer systems with complementary metal oxide semiconductor technology systems. This upgrade substantially reduced hardware maintenance and software licensing costs, significantly increased system speed and capacity, and reduced customer processing costs.

Transfer of Innovative Technology Into the NASA Infrastructure. NASA continued its role as a critical contributor to national IT research goals in three key program areas: the High Performance Computing and Communications, the Intelligent Synthesis Environment, and the Intelligent Systems initiatives. Each of these programs delivered innovative technologies and capabilities to support mission requirements at an affordable cost, at minimum risk, with a goal of maximum science return and engineering productivity.

The new Mission Control Center at Johnson Space Center illustrates how innovative commercial IT has facilitated the transition of the program-unique, 1960's-based manned space flight control center to one that meets the needs of the 21st century and beyond. The new control center eliminates the NASA-unique equipment and massive hardware orientation of the original Mission Control, replacing it with a modular, software-oriented design that uses standard, commercially available equipment. In similar fashion, the current Launch Processing System is being replaced at Kennedy Space Center to ensure economical operation of the Space Shuttle fleet through 2012; it is anticipated to save approximately 50 percent of the current system costs.

Improving IT Capability and Services Performance Measure. An Agencywide performance objective of improving IT capability and services has been established to evaluate accomplishment through performance measurements and is tracked against targets on a quarterly basis. One of the targets established under this objective was the completion of the Year 2000 remediation of mission-critical systems by March 1999 and nonmission-critical systems consistent with government-wide guidelines. See "Y2K

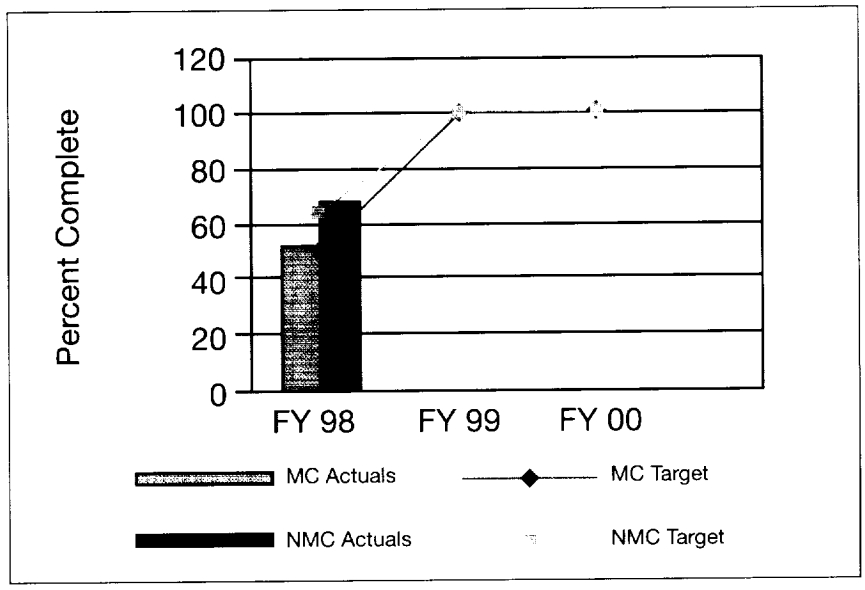
Quarterly Performance Metric." These IT performance data are verified by the Center Chief Information Officers and the staff of the NACC and the NISN; the verification process consists of review by several layers of management and compliance testing.

Financial Management. This area includes all Agency budget and accounting activities. Two performance measures have been established for financial management. One focuses on the planning and use of budget resources; the other on the payment process.

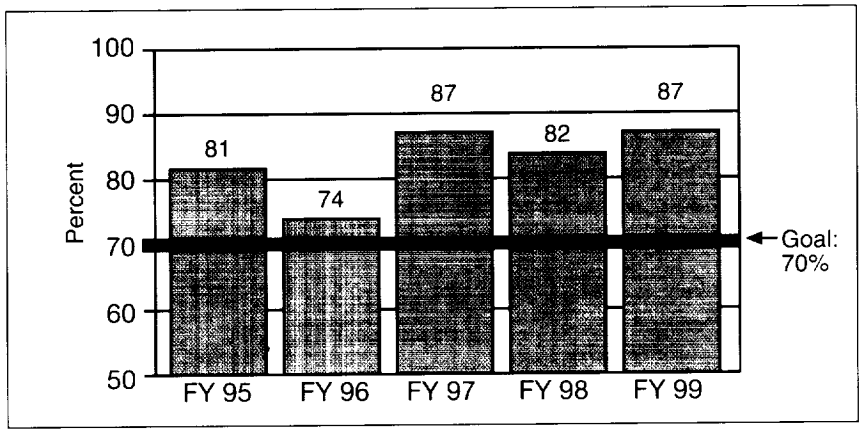
Financial Resources Used Performance Measure. Planning and use of budgetary resources are critical activities. NASA must effectively plan, control, distribute, and use available resources in a timely manner, consistent with legal and policy guidelines. A key metric is the rate of use during the performance period, measured by the percentage of costs incurred of financial resources available. The use of available financial resources is significantly influenced by the unpredictable nature of highly technical research and development activities. In recognition of this, a significant proportion of appropriations is normally available for obligations for a 2-year period.

This metric focuses on efforts to optimize investment strategies and systems for use of financial resources and to align financial resources with customer requirements. The target level of performance is to incur cost totaling 70 percent or more of available financial resources. Such resources include those against which costs have not been incurred from prior years, as well as new appropriations. Costs incurred include costs used for capital acquisition. In FY 1999, the financial resources usage rate reached 87 percent. See "Financial Resources Used."

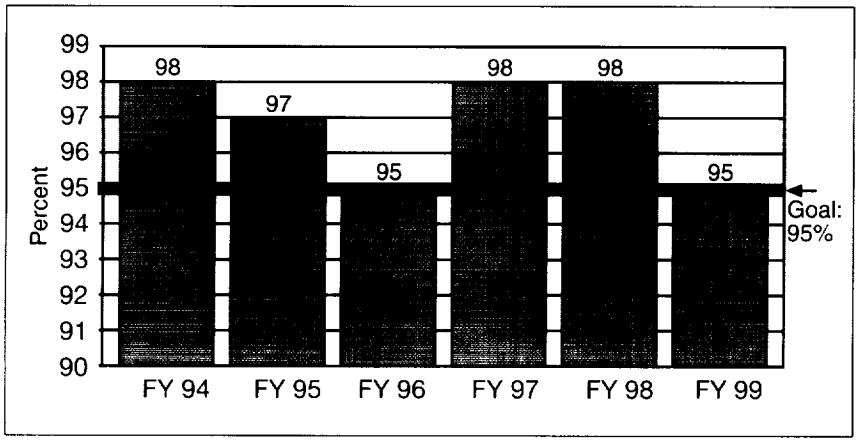
Timely Bill Payment Performance Measure. Vendors' invoices are paid in a timely and accurate manner. Prompt, accurate payment of vendors is a critical part of proper management of



Y2K Quarterly Performance Metric



Financial Resources Used



Timely Bill Payment

financial resources and a critical element in the maintenance and enhancement of working relationships with industry. This performance measure focuses on the percentage of vendor dollar billing paid on time and requires supporting capabilities from program and administrative officials, and timely, accurate, and reliable information. See "Timely Bill Payment."

Provide Aerospace Products and Capabilities

Mission and Goals

This process is the means by which the Enterprises and their Centers deliver systems (ground, aeronautics, and space), technologies, data, and operational services to customers so they can conduct research, explore and develop space, and improve life on Earth. The advancement of research and technology is conducted through the construction and operation of such facilities as telescopes and satellites and ground-based laboratories and test facilities.

The Agency uses the process to answer fundamental questions:

- What cutting-edge technologies, processes, techniques, and engineering capabilities must we develop to enable our research agenda in the most productive, economical, and timely manner?
- How can we most effectively transfer the knowledge we gain from our research and discoveries to commercial ventures in the air, in space, and on Earth?

The goals of the process are to:

- Enable Enterprises and their Centers to deliver products and services to customers more effectively and efficiently while extending the technology, research, and science benefits broadly to the public and commercial sectors
- Reduce cost and development time to deliver products and operational services that meet or exceed customers' expectations
- Seek out and apply innovative approaches, in cooperation with partners and customers, to enable ambitious new science, aeronautics, and exploration missions
- Focus on integrated technology planning and technology development driven by Enterprise and customer needs
- Facilitate the insertion of technology into all programs and proactively transfer technology, form commercialization partnerships, and integrate all innovative approaches to strengthen U.S. competitiveness
- Improve and maintain engineering capability, so that NASA will be recognized as the leading aerospace engineering research and development organization in the world
- Capture and preserve engineering and technological best practices and process knowledge to continuously improve program and project management

This process enables the Enterprises to reduce development cost and time for cutting-edge technology to enable increased opportunities for research, exploration, and discovery.

Accomplishments and Performance Measures

A comprehensive Program Management Development Process (NPG 7120.5A) has been developed and is being reassessed to establish appropriate measures for performance.

Percentage of NASA R&D Program Involved in Partnerships Performance Measure. This metric assesses the quality and alignment with customer needs of technology development by measuring the percentage of the research and development (R&D) program in partnership with industry. Using data input by Centers, the baseline was defined in FY 1999. The goal is to have 10 to 20 percent of the dollar value of the total R&D program involved in partnerships; in FY 1999, the Agency contributed 13.9 percent of its R&D investment to commercial partnerships.

Generate Knowledge

Mission and Goals

NASA provides new scientific and technological knowledge gained from exploring the Earth system, the solar system, and the universe beyond, as well as from conducting the necessary supporting R&D. The Generate Knowledge process ensures that this information is shared with various customers in industry, academia, other Government organizations, and the public. Project implementation is carried out in the Provide Aerospace Products and Capabilities process, and dissemination of knowledge is coordinated with the Communicate Knowledge process. The goals of the Generate Knowledge process are to extend the boundaries of knowledge of science, technology, and engineering, capture new knowledge in useful and transferable media, and share new knowledge with customers.

Accomplishments and Performance Measures

The process encompasses scientific and technical progress in many fields, including space and Earth science, space laboratory science, and basic and applied space technology. Progress is accomplished through flight experiments and laboratory and theoretical studies.

Peer-Reviewed and Merit-Based Competitive Process Performance Measure. Process performance can be measured in the selection of research projects through peer-reviewed and merit-based competition. Eighty-three percent of Agency research projects were submitted to peer-review processes exceeding the established target of 80 percent. See "FY 1999 Peer-Reviewed Research Projects."

	$ of Research		$ Conforming
	$176 million		$173 million
	$211 million		$203 million
	$198 million		$66 million
	$155 million		$140 million
	$218 million		$793 million
	$958 million		**$793 million**

* These figures represent only technology research applicable to multiple objectives. Technology development activities that support only a single program or project are not included.

FY 1999 Peer-Reviewed Research Projects

Communicate Knowledge

Mission and Goals

NASA uses this process to increase understanding of science and technology, advance its broad application, and inspire achievement and innovation. The process augments the transfer of technology performed within the normal course of conducting research, performing missions, and executing programs and projects overall. This process ensures that knowledge derived from the public's investment is presented and transmitted to meet the specific needs and interests of the public, educators, and other constituency groups.

The goal of this process is to ensure that customers receive the information derived from research and technology development efforts that they want, when they want it, for as long as they want it. This process addresses two objectives:

- Highlight existing and identifying new opportunities for customers, including the public, the academic community, and the Nation's students, to directly participate in the space research and discovery experience
- Improve the external constituent communities' knowledge, understanding, and use of the results and opportunities associated with programs

Accomplishments and Performance Measures

Centers use the Internet to make educational programs and the latest technological developments available to the public. For example, *Aerospace Technology Innovation,* the public's source for current information on NASA projects and opportunities in the areas of technology transfer and commercialization, aerospace technology development, and the commercial development of space, is available online. *Spinoff* is a publication produced annually, featuring the successful commercial and industrial applications of NASA technology. A user can browse previous or current editions or go to the *Spinoff* Home Page to submit his or her desired application of NASA technology and search the database for leads. Another avenue for the public to "shop" for technology is by searching the TechTracS system to find technology that is available for transfer, licensing, and commercialization. The search service scans across all commercial technology sites to discover advanced technologies and commercialization opportunities.

In our efforts to enhance the external community's knowledge of programs and results of investments, we have enhanced the Science and Technology Data Base, which includes historical publications that provide the public with a comprehensive understanding of the social, economic, technical, and scientific contribution from aeronautics and space. The public and technical community have access to Agency documents, taped oral history interviews, biographical files, and much more.

The Scientific and Technical Information program acquires, processes, archives, and disseminates information for the scientific community. The information records basic and applied research results from the efforts of scientists and engineers. The material is available on paper, film, multimedia, and electronic format. In addition, periodic bibliographies are developed, ranging from technical, medical, and aeronautical subjects to space flight.

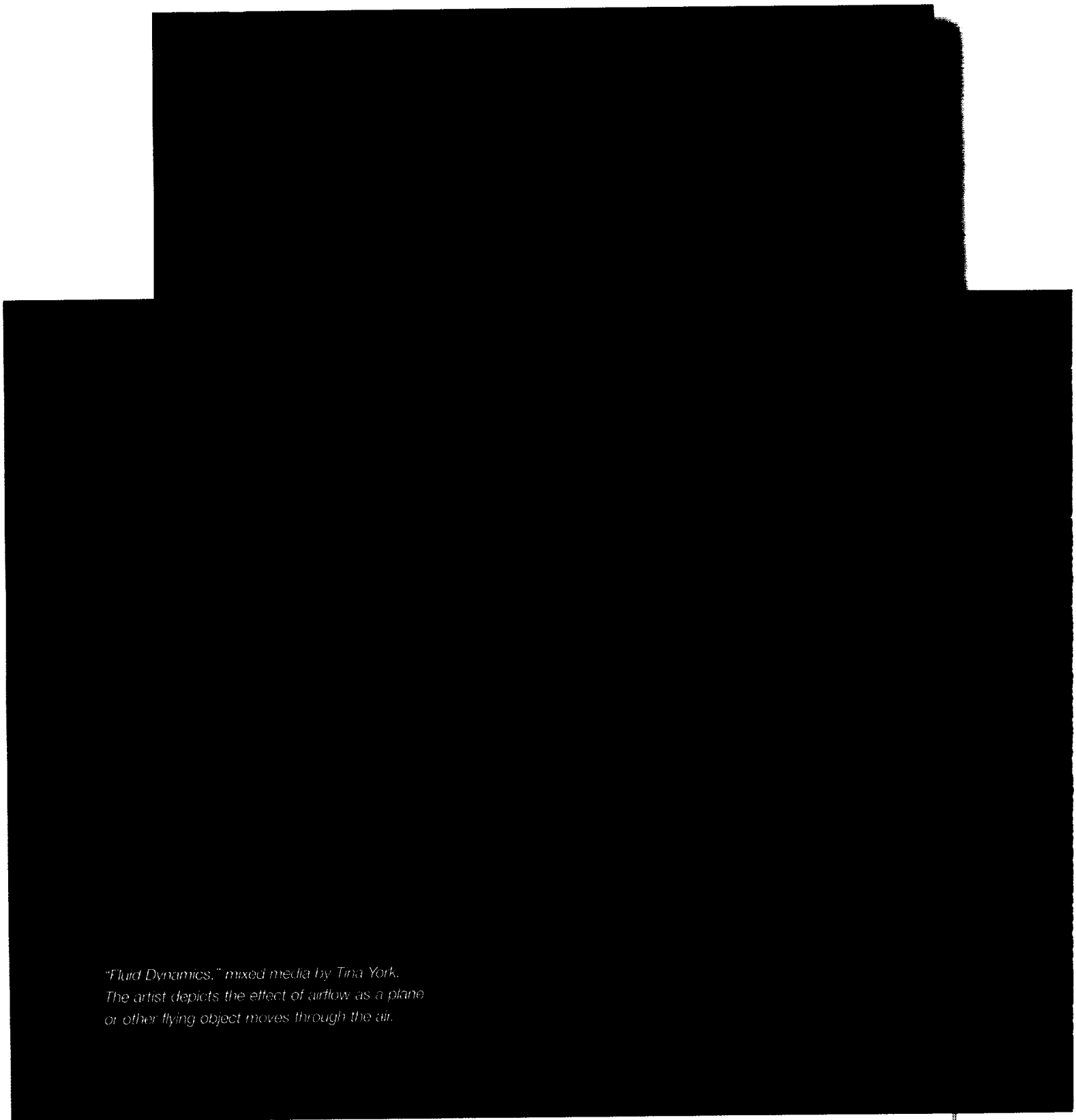
Considerable effort has been expended to increase the public's awareness of our Earth Science Enterprise (ESE) activities through the use of the national media. ESE increased the number of annual national news releases threefold, providing at least one major national news story a month, reaching the American people through broadcast and print media. The Enterprise contributed supporting video footage and animation that brought home the relevance ESE research to the American people—whether through the continuing studies of annual weather phenomena such as El Niño and La Niña, the monitoring of the global ozone situa-

tion, or the use of satellite technologies for precision farming.

Extensive national news coverage of two major spacecraft launches caught the attention of the taxpayers—Landsat 7 (joint NASA-U.S. Geological Survey partnership) and the QuikSCAT oceanography mission that captured three hurricanes at once as they threatened the American coasts on November 20, 1999.

ESE continues to develop fact sheets on climate issues, upcoming satellite missions, and educational products for use by teachers across the country. The program has supported educational television programs and hosted a science writer's workshop, teacher workshops, and an educator conference. ESE continues to show the relevance of its research to the American people through travelling exhibits, scientific conferences, and numerous media outlets.

The History Office issued 11 new publications and 1 CD-ROM, chronicling and placing NASA's activities and achievements in perspective for the American public. The Agency also hosted and cosponsored the symposium "Space Exploration at the Millennium: In Remembrance of Carl Sagan." The symposium offered a retrospective on one of this century's crowning accomplishments—the genesis of space exploration.



"Fluid Dynamics," mixed media by Tina York. The artist depicts the effect of airflow as a plane or other flying object moves through the air.

COMPLIANCE WITH LEGAL AND REGULATORY FINANCIAL REQUIREMENTS

FMFIA Assurance Statement

On the basis of NASA's comprehensive management control program, I am pleased to certify, with reasonable assurance, that NASA's systems of accounting and internal controls are in compliance with the internal control objectives in OMB's Bulletin Number 98-08, as amended. I also believe these same systems of accounting and internal controls provide reasonable assurance that the Agency is in compliance with the provisions of the Federal Managers' Financial Integrity Act.

Daniel S. Goldin
NASA Administrator

This section provides information on compliance with the:

- Federal Managers' Financial Integrity Act
- Inspector General Act Amendments
- Federal Financial Management Improvement Act
- Prompt Payment Act
- Civil Monetary Penalty Act
- Debt Collection Improvement Act

Federal Managers' Financial Integrity Act (FMFIA)

The Federal Managers' Financial Integrity Act (FMFIA) requires agencies to annually provide a statement of assurance regarding management controls and financial systems.

NASA is pleased to report continued progress in strengthening management controls.The reengineered program/project management process is in place. All Centers and Headquarters have obtained third-party International Organization for Standardization (ISO) certification. The establishment of ISO quality management systems is a major management control initiative and provides for ongoing corrective action and continuous improvement of key management processes. Management has identified and is in the process of taking additional corrective actions to improve information technology security.

Agency financial management controls and systems, taken as a whole, provide reasonable assurance that its accounting systems comply with appropriate Federal requirements.This conclusion is based on the review and consideration of a wide variety of evaluations, internal analyses, reconciliations, reports, and other infor-

mation, including quality assurance evaluations, General Accounting Office and Office of Inspector General audits, and an independent public accountant's opinion on our financial statements and reports on our internal control structure and compliance with laws and regulations.

Our conclusion that reasonable controls are in place does not mean there are no management improvement opportunities. Audits, internal reviews, and other evaluations have revealed management weaknesses in individual systems. We are aggressively correcting identified weaknesses. This year, corrective actions were completed on three areas of concern reported in FY 1998, and our level of effort is increasing on the two previously reported significant areas of concern. Two new significant areas of concern, described below, have been added.

Status of Significant Areas of Concern

Financial Management Systems. Validation testing of the system delivered by the Integrated Financial Management System (IFMS) contractor revealed substantially more defects than anticipated. This resulted in instituting a more comprehensive program of software testing and remediation than planned. In addition, key resources needed for initial Center implementations were devoted to software remediation. These events have resulted in a slip in schedule of at least 12 months. Additional testing is ongoing. Until an IFMS is in place, NASA will continue to report financial management systems as a significant area of concern.

Equitable Environmental Cost Sharing. Controls have been established and potentially responsible parties have been identified in addressing equitable environmental cost sharing. NASA will pursue cost-sharing agreements when it is determined to be the appropriate course of action. This significant area of concern is closed.

Information Technology (IT) Security. NASA procured and is now installing a common set of network monitoring tools to improve our intrusion detection, reporting, and coordination capability. Steps have been taken to improve the effectiveness of the NASA Automated Systems Incident Response Capability (NASIRC), and a Memorandum of Agreement with the Federal Computer Incident Response Capability (FEDCIRC) has been negotiated, which includes the expedited exchange of information on incidents.

We are working aggressively to improve Information Technology Security (ITS) training. In FY 1999, a multimedia CD-ROM was distributed, created in close cooperation with the Defense Information Systems Agency, as part of all employees' mandatory annual ITS awareness training. The Chief Information Officer (CIO) or Deputy CIO visited all Centers for briefings on the need for ITS and the requirement to adhere to policies. Center Directors attended and ensured participation by civil servants and contractors, as well as senior and line management.

System and network administrators are the first line of defense in protecting IT assets from intrusions and detecting intrusions. Working with other agencies and the private sector, an ITS training program is being created for system and network administrators; it is currently in the pilot stage. When the program is available, demonstrated proficiency of both civil service and contractor administrators in ITS will be mandatory.

We are also integrating training on ITS risk assessment and management into the curriculum of the Agency's Academy of Program/Project Leadership. The life

cycle approach used in the training will increase systems security and further sensitize managers to its importance.

Year 2000 (Y2K) Program. The implementation of Year 2000 Compatibility and Cost Analysis was completed. This significant area of concern reported in FY 1998 is now closed.

Cost-Benefit Analysis. NASA recognizes the important role cost-benefit analyses play in investment decisions and will continue to strengthen its cost-benefit capabilities. The Outsourcing Desktop Initiative for NASA (ODIN) is now in the implementation stage and closely monitored. A cost comparison study of aircraft utilization at Marshall Space Flight Center was completed in accordance with guidance in OMB Circular A-76, Performance of Commercial Activities, and A-76 studies at all Centers are in process. As a result, we consider this significant area of concern closed.

New Significant Areas of Concern

There are two new significant areas of concern to report: funding of the decommissioning of the Plum Brook reactor and implementation of controls relating to Flight Termination Systems.

Decommissioning of Plum Brook Reactor. A decommissioning plan is being submitted to the Nuclear Regulatory Commission. The total estimated cost for decommissioning the Plum Brook reactor is $157 million. Funding requirements have been submitted to the Office of the Chief Financial Officer (CFO) and the Capital Investment Council. Decommissioning is currently scheduled to begin in FY 2002.

Flight Termination Systems (FTS). Work began on the FTS project in FY 1999 to canvas currently available FTS products, coordinate efforts with the Range Commander's Council, and, in cooperation with the National Security Agency, consider new, more secure products. New policy covering FTS will be proposed to the National Security Telecommunications and Information Systems Security Committee (NSTISSC), co-chaired by NASA, for approval by July 2000. The NSTISSC is expected to approve the new policy shortly thereafter, and Agency policy, derived from the new NSTISSC policy, will be completed 90 days after the new Federal policy becomes effective.

Commitment to Strong Management Controls

The reporting of corrective actions for significant areas of concern does not provide a full account of the management control improvements undertaken. NASA is committed to continuously improve the management of programs and related controls independently, as well as part of Governmentwide reengineering and reinventing processes, and to removing unnecessary, burdensome requirements and controls, while evaluating streamlined processes to ensure that reasonable controls remain in place. NASA is committed to improving every aspect of management.

Inspector General Act Amendments

The Inspector General Act (as amended) requires semiannual reporting on audits and related activities as well as Agency followup. For the second year in a row, this report is now included in the Accountability Report. It is required by Section 106 of the Inspector General Act Amendments (Public Law 100-504) and provides information on the status of audit reports open over 1 year as of September 30, 1999. See "Audits Open Over 1 Year." Statistics on the total number of audit reports and dollar value of disallowed costs for FY 1999, as well as statistics on the total number of audit reports and dollar value of recommendations that funds be put to better use as agreed to by management decision, are also addressed (see Table I).

Audit Followup and Internal Management Controls

Effective audit followup and internal management controls are a high priority

Table I.
Disallowed Costs and Funds Put to Better Use
(October 1, 1998, Through September 30, 1999)

Category	A. Audit Reports With Disallowed Costs		B. Audit Reports With Recommendations That Funds Be Put to Better Use	
	Number	Value	Number	Value
A. Audit reports with management decisions on which final action had not been taken at the beginning of the reporting period	1	$108,000	2	$17,600,000
B. Audit reports on which management decisions were made during the reporting period	3	$1,160,000	4	$64,184,000
C. Total audit reports pending final action during the reporting period (total of A + B)	4	$1,268,000	6	$81,784,000
D. Audit reports on which final action was taken during the reporting period				
1. Value of disallowed costs collected by management	3	$1,160,000	1	$4,470,000
2. Value of costs disallowed that was written off by management	0	$0	3	$59,714,000
3. Total (lines D1 + D2)	3	$1,160,000	4	$64,184,000
E. Audit reports needing final action at the end of the reporting period (C - D)	1	$108,000	2	$17,600,000

for all levels of management. In conjunction with the Office of the Inspector General (OIG), we strive to identify and correct deficiencies as early as possible. In accordance with the tenets of the National Performance Review, we continue to collaborate with the OIG to discover new and better processes that will best serve the needs of NASA and the public.

The Headquarters Management Assessment Division continues to improve the audit resolution and follow-up process. We are strengthening our virtual team of Audit Liaison Representatives (ALR's) with improved automation and communication. We are working with the OIG to develop process flow charts and Agencywide roles and responsibilities for ALR's. We are also talking to and meeting with other Federal agencies to discuss how they manage audit resolution and closure.

In the last fiscal year, management has seen a sizable increase in open OIG recommendations. The Management Assessment Division is acutely aware of this situation and is producing Agencywide metrics to identify where

these open recommendations are and alerting the ALR network so additional resources can be applied to determine the cause for this increase. Training modules and standard procedures have been developed to better educate management in the art of monitoring timely responses and report followup. Finally, we are working with the OIG to maintain an electronic service that allows for the delivery of reports and other information effectively and efficiently. This service transmits audit information to the appropriate audience minutes after the document is officially released.

In a September 1999 report, the OIG stated that "NASA management did not ensure that authorized funds were used for their intended purposes by properly matching disbursements to obligations . . . disbursements . . . may have been charged to the incorrect appropriation, which may have resulted in violations of fiscal law." The OIG report also contended that the practice of charging disbursements to the oldest costed obligation did not ensure that appropriated funds were used for the intended purpose on contracts funded with multiple appropriations. The OIG recommended that NASA ". . . require contractors to submit specific obligation data, including the appropriation and program year, with their invoices to enable financial management personnel to properly match disbursements to the appropriate obligations on contracts involving multiple appropriations."

NASA management did not agree with these conclusions and recommendations. It believes that disbursements are properly matched with obligations through its well-controlled contractor financial reporting and Agency accounting processes. Contractors report costs in categories that track the NASA accounting structure, which identifies the project, funding source, and program year. The discipline imposed in the combined costing and disbursing processes ensures that disbursements are charged to the correct appropriation. The NASA General Counsel supported management's conclusion that current processes ensure compliance with applicable law. The issue is still under consideration by the OIG.

NASA has addressed each item in a management letter of recommendations resulting from the audit of our FY 1998 financial statements. A number of these recommendations have been fully implemented and work will continue to see full implementation of the remaining items.

Federal Financial Management Improvement Act (FFMIA)

This law requires agencies to report on their substantial compliance with Federal financial management system requirements, Federal accounting standards, and the U. S. Government Standard General Ledger. NASA substantially complies with the FFMIA.

Prompt Payment Act

This Act requires agencies to pay vendors' invoices on time. In FY 1999, NASA processed 95 percent of its 119,322 payments on time. Virtually all recurring payments are processed electronically. Centers have maximized electronic payment for all vendors and implemented the electronic funds transfer provisions of the Debt Collection Improvement Act of 1996 in accordance with the act and Department of the Treasury regulations.

Civil Monetary Penalty Act

NASA does not assess civil penalties and therefore has none to report.

Debt Collection Improvement Act

Accounts receivable totaled $131,107 million at September 30, 1999. Of that amount, $127,720 million was receivable from other Federal agencies. The remaining $3,387 million (net of $1,121—allowance for uncollectable receivables) was receivable from the public.

Audits Open Over 1 Year

Report No.	Report Date	Disallowed Costs	Better Use of Funds
LA-95-001	[illegible]	$0	$16,400,000

NASA Aircraft Management
The OIG contended that management has not complied with OMB Circular No. A-76. Management disagreed. A final management decision not accepting the OIG's recommendations was made by the Audit Follow-up Official after a December [illegible] meeting. This report is closed.

Report No.	Report Date	Disallowed Costs	Better Use of Funds
IG-97-011	12/20/96	$2,07[illegible],000	$0

Shuttle Processing Contract Subcontracting—Circumstances Indicate Procurement Fraud
This matter is currently under OIG criminal and civil investigation.

Report No.	Report Date	Disallowed Costs	Better Use of Funds
IG-97-024	[illegible]	$0	$57,000,000

Cost Sharing for Cleanup Activities at JPL
The OIG recommended that NASA pursue negotiations with all parties responsible for cleanup activities. NASA has initiated negotiations, but does not expect to reach settlement for some time because of technical and legal aspects.

Report No.	Report Date	Disallowed Costs	Better Use of Funds
IG-97-026	[illegible]	$1[illegible],000	$0

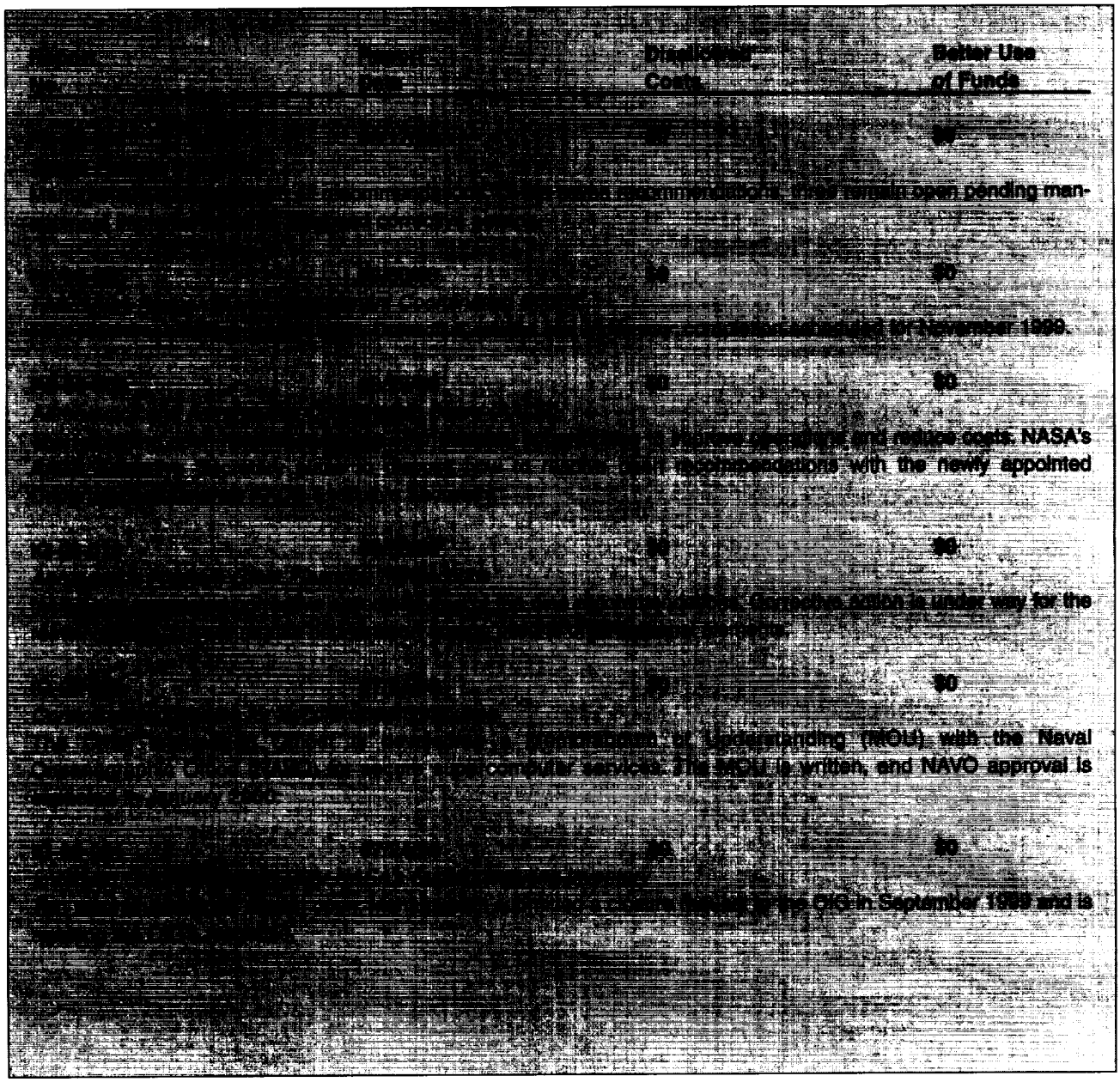
Commercial Use of NASA's Tracking and Data Relay Satellite System
Management concurred with all recommendations; three recommendations have been closed. The fourth will remain open until final resolution of an ongoing OIG investigation.

Report No.	Report Date	Disallowed Costs	Better Use of Funds
IG-97-0[illegible]	[illegible]	$0	$0

Status of Plum Brook Station Nuclear Facilities
NASA has committed to the Nuclear Regulatory Commission to submit a decommissioning plan to terminate the license for the Reactor Facility at the end of 1999 and to complete decommissioning activities by the end of 2007.

Report No.	Report Date	Disallowed Costs	Better Use of Funds
IG-97-040	[illegible]	$0	$0

Facility Cost Recovery at NASA's Aeronautics Centers
The remaining open recommendation concerns establishment of criteria for approving nonreimbursable test agreements. Management [illegible]



	Disallowed Costs	Better Use of Funds
	$0	$0
		...mmendations have remain open pending man-
	$0	$0
		...ed in November 1999.
	$0	$0
		...ures and reduce costs. NASA's ...ecommendations with the newly appointed
	$0	$0
		...ve action is under way for the
	$0	$0
		...ing (MOU) with the Naval ...ervices. The MOU is written, and NAVO approval is
	$0	$0
		...ed in the OIG in September 1999 and is

Report No.	Report Date	Disallowed Costs	Better Use of Funds
IG-98-024	08/18/98	$0	$0

Cost Sharing for Santa Susana Field Laboratory (SSFL) Cleanup Activities

Management is awaiting completion of negotiations concerning environmental cleanup cost sharing at another NASA facility before proceeding with negotiations concerning cost sharing at the SSFL. With respect to the preventive costs, management is waiting for completion of the contracting officer's review of the contractor's charging practices.

IG-98-027	09/21/98	$13,000	$0

NASA Costs Paid to Rehired Former JPL Employees

One recommendation remains open. Management anticipates the plan to address this recommendation will be in place in December 1999 and action will be completed, with closure of the audit by the end of January 2000.

IG-98-028	09/08/98	$0	$0

Transportation Costs for Non-NASA Payloads Flown on Spacehab Module

NASA concurred with the recommendation and is developing a pricing strategy. We anticipate completion in December 1999.

IG-98-030	09/14/98	$0	$0

Single Source Suppliers of Critical Items

Management concurred with all recommendations. One recommendation remains open pending completion of adding language to NPG 7120.5A.

IG-98-031	09/22/98	$0	$0

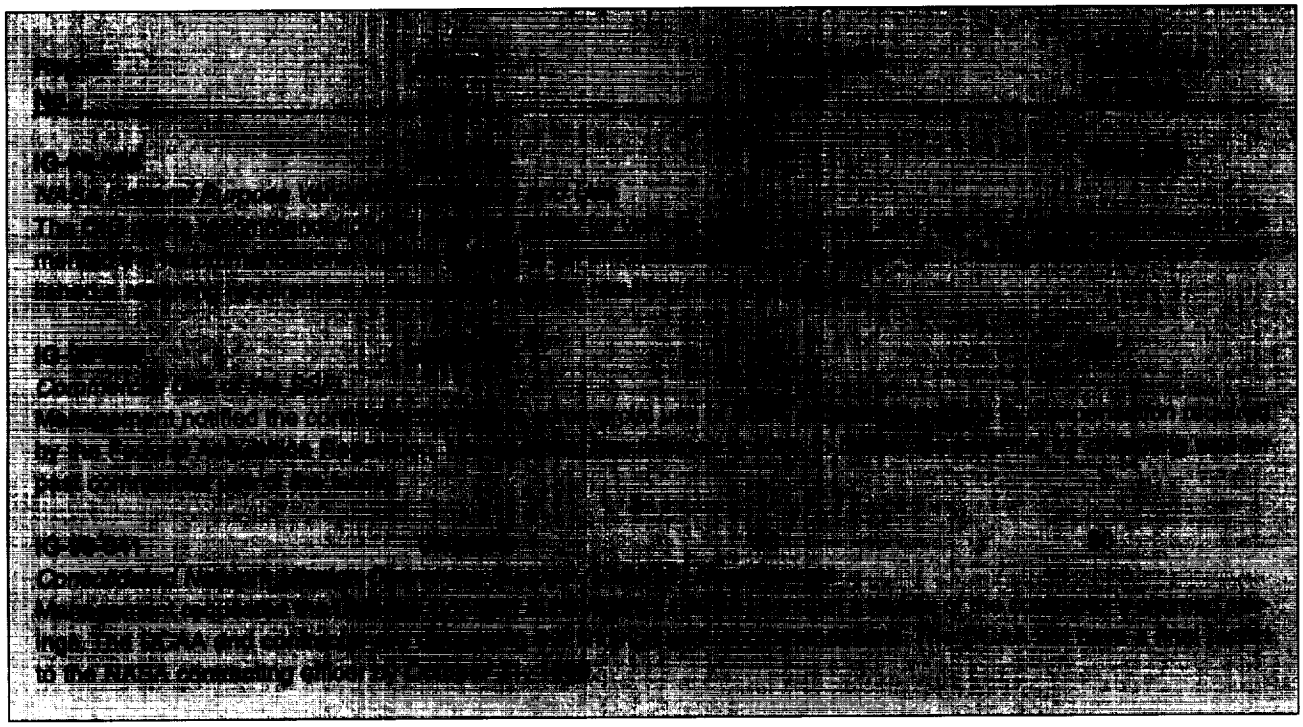
National Technology Transfer Center (NTTC)

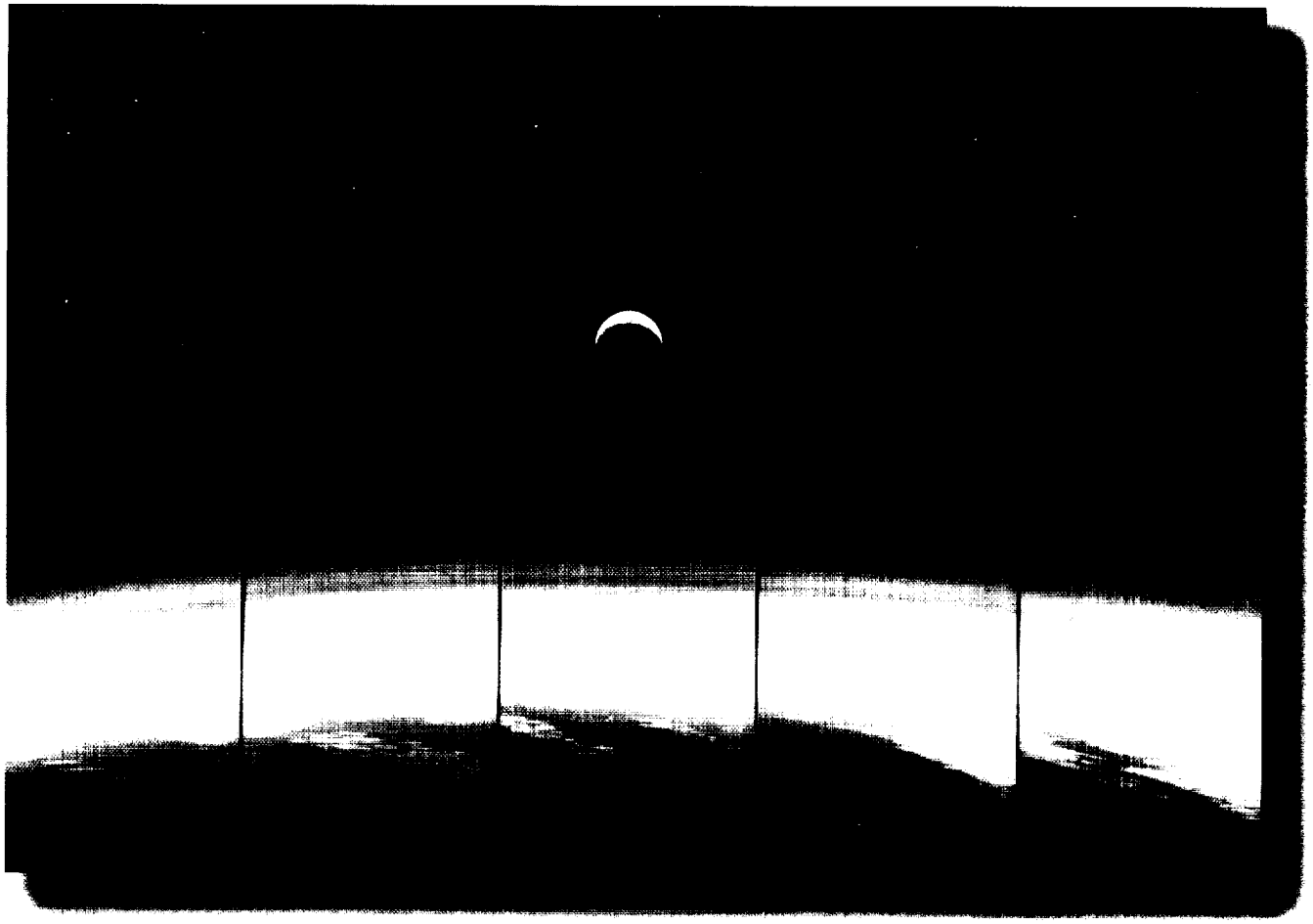
Two recommendations remain open. Management entered into a new cooperative agreement, which takes effect in October 1999; new reporting requirements will be included.

IG-98-034	09/25/98	$0	$0

IT Capital Planning/Investment Control

The OIG's wording recommendations were provided for inclusion in NPG 7120.5A; it has not been released.





"View of Earth," oil by Dennis Davidson. These panels, an Earth Orbital Science Project, represent windows or portals between ourselves and Earth.

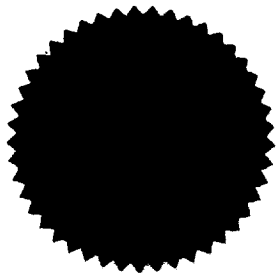
CERTIFICATE OF EXCELLENCE IN ACCOUNTABILITY REPORTING

Presented to

National Aeronautics and Space Administration

For its Annual Accountability Report for the Fiscal Year Ended September 30, 1998

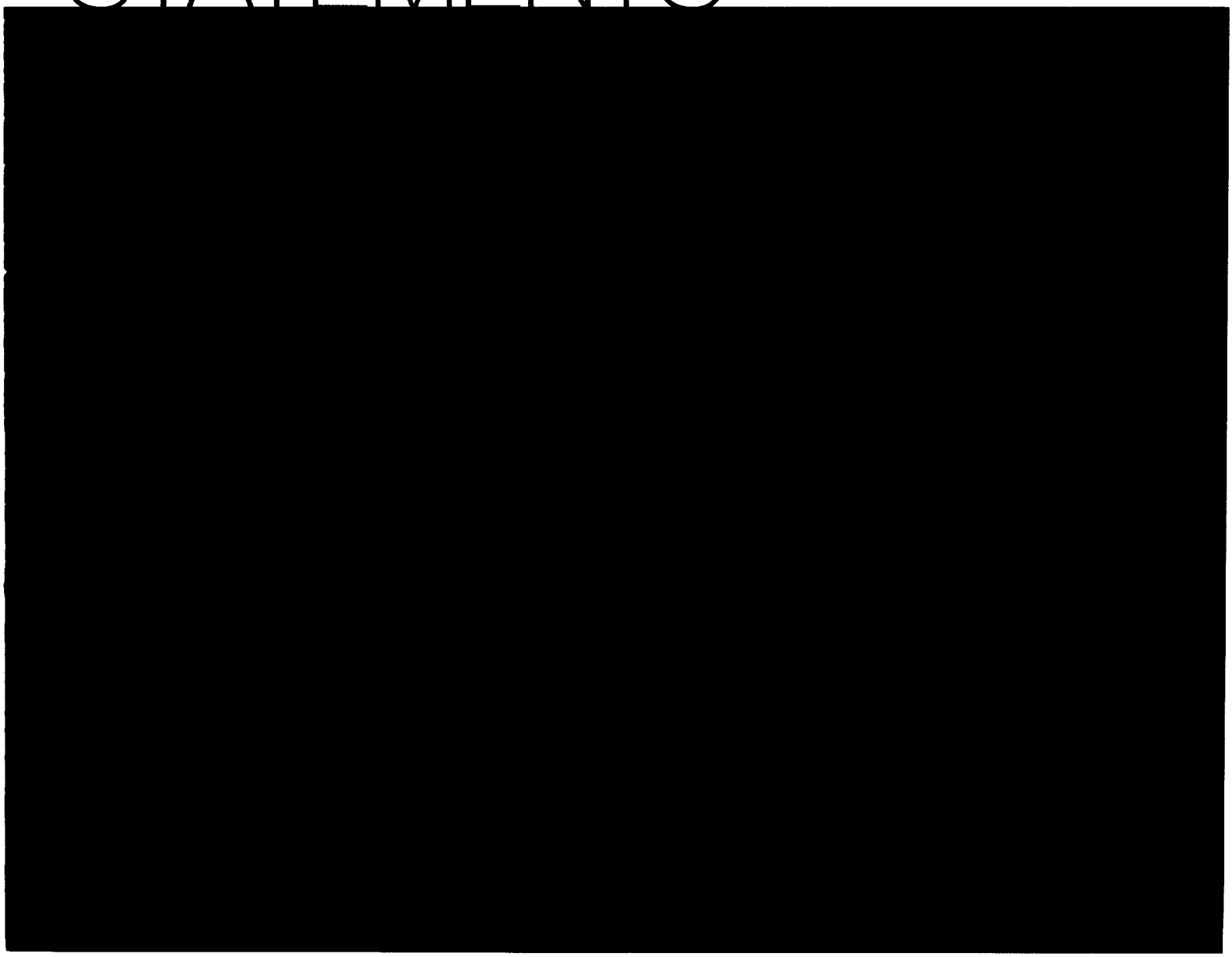
A Certificate of Excellence in Accountability Reporting is presented by the Association of Government Accountants to federal government agencies whose annual Accountability Reports achieve the highest standards in presenting their programs and financial affairs.



Chair, Certificate of Excellence in Accountability Reporting Board

Executive Director

FINANCIAL STATEMENTS



Introduction to Financial Statements

The National Aeronautics and Space Administration's (NASA's) financial statements reflect the overall financial position of NASA offices and activities, including assets and liabilities, and the results of operations, pursuant to the requirements of Federal law (31 U.S.C. 3515b). The statements have been prepared from NASA's books and records.

These statements are in addition to separate financial reports prescribed by the Office of Management and Budget (OMB) and the U.S. Department of the Treasury used to monitor and control budgetary resources, which are prepared from the same books and records. The statements should be read with the understanding that they are for a component of the U.S. Government, a sovereign entity. For example, the U.S. Department of the Treasury, another Federal agency, holds NASA's Fund Balance. Also, NASA has no authority to pay liabilities not covered by budgetary resources. Liquidation of such liabilities requires enactment of an appropriation.

NASA received six consecutive "Unqualified Opinions" on its financial statements. The first two opinions were provided by the Inspector General. The last four opinions were provided by an independent public accounting firm. These noted statements and related opinions represent major milestones in NASA's continuing quest for financial management excellence.

National Aeronautics and Space Administration
Statement of Financial Position
as of September 30
(In Thousands)

Assets (Note 9):	1999	1998
Intragovernmental Assets:		
Fund Balance With Treasury (Note 2)	$6,211,702	$6,256,007
Investments (Note 3)	16,730	16,759
Accounts Receivable, Net (Note 4)	127,720	153,825
Advances and Prepaid Expenses	15,560	4,234
Total Intragovernmental Assets	6,371,712	6,430,825
Accounts Receivable, Net (Note 4)	3,387	4,662
Advances and Prepaid Expenses	—	190
Operating Materials and Supplies (Note 5)	2,256,179	2,280,577
Property, Plant, and Equipment, Net (Note 6)	23,478,807	21,367,659
Total Assets	**$ 32,110,085**	**$ 30,083,913**
Liabilities:		
Intragovernmental Liabilities:		
Accounts Payable	$ 172,144	$ 275,318
Other Liabilities (Note 7)	48,407	35,687
Total Intragovernmental Liabilities	220,551	311,005
Accounts Payable	2,910,280	2,840,341
Other Liabilities (Notes 7 and 8)	332,597	334,407
Environmental Cleanup Costs (Note 1)	1,110,412	1,405,372
Workers' Compensation (Note 1)	57,371	51,455
Commitments and Contingencies (Note 1)	351	68,268
Total Liabilities	**$ 4,631,562**	**$ 5,010,848**
Net Position:		
Unexpended Appropriations (Note 11)	$ 3,082,983	$ 3,116,819
Cumulative Results of Operations	24,395,540	21,956,246
Total Net Position	**$ 27,478,523**	**$ 25,073,065**
Total Liabilities and Net Position	**$ 32,110,085**	**$ 30,083,913**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Statement of Net Cost
for the Fiscal Year Ended September 30, 1999
(In Thousands)

Program/Operating Expenses by Enterprise:	
Human Exploration and Development of Space:	
Space Shuttle	$ 3,285,407
Space Station	2,555,850
Life and Microgravity	296,645
U.S./Russian Cooperative	151,396
Payload Utilization and Operations	375,970
Total Human Exploration and Development of Space	6,665,268
Space Science:	
Space Science	2,543,408
Planetary Exploration	34,181
Total Space Science	2,577,589
Earth Science:	
Mission to Planet Earth	1,741,667
Total Earth Science	1,741,667
Aero-Space Technology:	
Aeronautics Research and Technology	1,287,168
Space Access and Technology	569,775
Commercial Programs	167,931
Total Aeronautics and Space Transportation	2,024,874
Total Enterprise Program Costs	**13,009,398**
Costs Not Assigned to Enterprises:	
Mission Communication Services	430,503
Space Communication Services	184,978
Academic Programs	126,819
Other Programs	28,922
Trust Funds	832
Reimbursable Expenses	817,810
Total Costs Not Assigned to Enterprises	**1,589,864**
Total Program Expenses	**14,599,262**
Costs Not Assigned to Programs:	
Change in Unfunded Expenses (Note 12)	(363,120)
Depreciation Expense	2,076,695
Funded Changes in Capitalized Property and Inventory	(4,056,211)
Total Costs Not Assigned to Programs	**(2,342,636)**
Less: Earned Revenues Related to Reimbursable Expenses	(817,810)
Net Cost of Operations (Note 13)	**$ 11,438,816**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Statement of Changes in Net Position
for the Fiscal Year Ended September 30, 1999
(In Thousands)

Net Cost of Operations	$ (11,438,816)
Financing Sources:	
Appropriations Used	13,656,145
Net Property Transfers	9,788
Donations	9,018
Interest Revenue, Federal	812
Imputed Financing	120,400
Other Revenues	22,646
Less: Receipts Transferred to Treasury	(22,646)
Net Results of Operations	2,357,347
Asset Adjustments (Note 1)	81,947
Net Change in Cumulative Results of Operations	2,439,294
Decrease in Unexpended Appropriations	(33,836)
Change in Net Position	2,405,458
Net Position - Beginning of Period	25,073,065
Net Position - End of Period	**$ 27,478,523**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Statement of Budgetary Resources
for the Fiscal Year Ended September 30
(In Thousands)

Budgetary Resources (Note 14):	**1999**	**1998**
Budget Authority	$ 13,650,336	$ 13,649,576
Unobligated Balances - Beginning of Period	1,065,239	1,067,624
Net Transfers of Prior-Year Balances, Actual	—	(45)
Spending Authority from Offsetting Collections	708,017	630,046
Recoveries of Prior-Year Obligations	685,805	—
Cancellation of Expired Accounts	(34,668)	(27,616)
Total Budgetary Resources	**$ 16,074,729**	**$ 15,319,585**
Status of Budgetary Resources:		
Obligations Incurred	$ 15,210,387	$ 14,254,346
Unobligated Balances - Available	747,646	935,394
Unobligated Balances - Restricted	116,696	129,845
Total Status of Budgetary Resources	**$ 16,074,729**	**$ 15,319,585**
Outlays:		
Obligations Incurred, Net	$ 14,524,582	$ 14,254,346
Less: Spending Authority from Offsetting Collections	(708,017)	(630,046)
Obligations Incurred, Net	**13,816,565**	**13,624,300**
Obligated Balance, Net - Beginning of Period	5,100,309	5,682,216
Less: Obligated Balance, Net - End of Period	(5,253,158)	(5,100,309)
Total Outlays	**$ 13,663,716**	**$ 14,206,207**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Statement of Financing
for the Fiscal Year Ended September 30, 1999
(In Thousands)

Obligations and Nonbudgetary Resources:	
Obligations Incurred, Net	$ 14,524,582
Less: Spending Authority from Reimbursable Customers	(851,475)
Financing Imputed for Cost Subsidies	120,400
Total Obligations as Adjusted and Nonbudgetary Resources	**13,793,507**
Resources That Do Not Fund Net Cost of Operations:	
Change In Amount of Goods, Services, and Benefits Ordered But Not Yet Received or Provided	(13,902)
Change in Inventory	1,847
Costs Capitalized in the Statement of Financial Position	(4,056,211)
Total Resources That Do Not Fund Net Cost of Operations	**(4,068,266)**
Costs That Do Not Require Resources:	
Depreciation	2,076,695
Total Costs That Do Not Require Resources	**2,076,695**
Change in Financing Sources Yet to be Provided	(363,120)
Net Cost of Operations	**$ 11,438,816**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Notes to Financial Statements
for the Fiscal Year Ended September 30, 1999

The following notes represent integral disclosures to NASA's financial statements.

1. Summary of Accounting Policies and Operations:

This note summarizes NASA's accounting policies and operations.

Reporting Entity
NASA is an independent agency established to plan and manage the future of the Nation's civil aeronautics and space program. It has established four Strategic Enterprises—Space Science, Earth Science, Human Exploration and Development of Space, and Aero-Space Technology—to implement its mission and communicate with external customers. These financial statements reflect all activities, including those of its nine Centers, Headquarters, and the Jet Propulsion Laboratory. The Jet Propulsion Laboratory is a Federally Funded Research and Development Center owned by NASA, but managed by an independent contractor. Financial management of operations is the responsibility of Agency officials at all organizational levels. The NASA accounting system consists of 10 distinct operations located at the Centers and Headquarters. Although each Center is independent of the others and has its own Chief Financial Officer, they all operate under Agencywide financial management policies. The accounting system provides basic information necessary to meet internal and external budget and financial reporting requirements and provide fund control and accountability. All significant intra-entity activities have been eliminated.

Basis of Presentation
These financial statements were prepared to report the financial position and results of operations as required by the Chief Financial Officers Act of 1990 and the Government Management Reform Act of 1994. They were prepared from the books and records of NASA, in accordance with Statements of Federal Financial Accounting Standards (SFFAS) promulgated by the Federal Accounting Standards Advisory Board, which constitute generally accepted accounting principles (GAAP) for Federal Government entities, as well as accounting policies and practices summarized in this note. These financial statements were prepared under the accrual basis of accounting, in which expenses and revenues are recorded in the period in which they are incurred or earned, respectively.

Implementation of New Accounting Standards
NASA implemented the provisions of SFFAS No. 14, "Amendments to Deferred Maintenance Reporting." Deferred maintenance will now be reported as required supplementary information and not in association with the Statement of Net Cost.

NASA will implement two additional standards in future reports.

(1) SFFAS No. 10, "Accounting for Internal Use Software." This statement establishes accounting standards for the cost of software developed or obtained for internal use. The provisions of this standard are effective for fiscal year 2001.

(2) SFFAS No. 15, "Management's Discussion and Analysis." This statement establishes the requirements for reporting an entity's performance measures, financial statements, systems and controls, compliance with laws and regulations, and actions taken or planned to address problems. The provisions of this standard are effective for fiscal year 2000.

NASA is working toward the timely implementation of these reporting standards.

Budgets and Budgetary Accounting
NASA is funded by four appropriations that require individual treatment in its accounting and control system. Reimbursements to appropriations for 1999 totaled approximately $800 million. As part of its reimbursable program, the Agency launches devices into space and provides tracking and data relay services for the U.S. Department of Defense, the National Oceanic and Atmospheric Administration, and the National Weather Service.

On the Statement of Budgetary Resources, Unobligated Balances - Available represent the amount remaining in appropriation accounts available for obligation in the next fiscal year. Unobligated Balances - Restricted represent the amount remaining in appropriation accounts that can only be used for adjustments to previously recorded obligations.

Use of Estimates
The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from these estimates.

Fund Balance With Treasury
Cash receipts and disbursements are processed by the U.S. Department of the Treasury (Treasury). Fund Balance With Treasury includes appropriated funds, trust funds, and deposit funds for advances received for reimbursable services.

Investments in U.S. Government Securities
Intragovernmental nonmarketable securities include the following investments:

(1) National Aeronautics and Space Administration Endeavor Teacher Fellowship Trust Fund established from public donations in tribute to the crew of the Space Shuttle Challenger

(2) Science Space and Technology Education Trust Fund established from public donations for programs to improve science and technology education

Accounts Receivable
Most receivables are for the reimbursement of research and development services related to satellites and launch services that were provided to other Federal Government agencies. The allowance for uncollectible accounts is based upon each Center's evaluation of its individual accounts receivable, considering the probability of failure to collect based upon current status, financial and other relevant characteristics of debtors, and the relationship with the debtor. Under a cross-servicing arrangement, accounts receivable over 180 days delinquent are turned over to the Treasury for collection.

Advances and Prepaid Expenses
Advances and prepaid expenses represent amounts paid in advance of the receipt of goods and services to other Federal government agencies. Prepaid amounts are recognized as expenses when related goods and services are received. The Department of the Navy was prepaid $14 million to support work on the Interim Control Module for Space Station. The remaining $1.6 million was prepaid to eight other agencies.

Property, Plant, and Equipment
NASA-owned property, plant, and equipment are held by the Agency and its contractors and grantees. Property with a unit cost of $100,000 or more and a useful life of 2 years or more is capitalized; other property is expensed when purchased. Capitalized cost includes all costs incurred to bring the property to a form and location suitable for its intended use. The Agency continues to maintain physical accountability for all property, plant, and equipment regardless of cost.

Under provisions of the Federal Acquisition Regulation (FAR), contractors are responsible for control over and accountability for Government-owned property in their possession. Contractors and grantees report on property in their custody annually.

In accordance with SFFAS No. 6, these financial statements report depreciation expense using the straight-line method. Useful lives were established as follows: 40 years for buildings; 15 years for other structures and facilities; 15 years for space hardware; 7 years for special test equipment and tooling; 5 to 20 years for other equipment depending on its nature; and 25 years for Space Shuttle orbiters. Useful lives for assets in space are generally their basic mission lives, ranging from 2 to 20 years.

The implementation of SFFAS Nos. 6 and 8 during fiscal year 1998 required procedural changes in the reporting of capitalized property. These changes have precipitated residual adjustments in the fiscal year 1999 Statement of Changes in Net Position, which have been reported as asset adjustments.

Liabilities Covered by Budgetary Resources
NASA accrues costs and recognizes liabilities based on information provided monthly by contractors on NASA Contractor Financial Management Reports (NASA Forms (NF) 533M and Q). In addition, accounts payable includes amounts recorded for receipt of goods or services furnished to the Agency. Independent audits by the Defense Contract Audit Agency ensure the reliability of reported costs and estimates. To provide further assurance, financial managers are required to test the accuracy of cost accruals generated from the monthly reports, and Headquarters independently analyzes the validity of Centers' data.

Liabilities Not Covered by Budgetary Resources
Liabilities not covered by budgetary resources include certain environmental matters, legal claims, pensions and other retirement benefits, workers' compensation, annual leave (see discussion below), and closed appropriations.

Liabilities not covered by budgetary resources consist primarily of environmental cleanup costs as required by Federal, State, and local statutes and regulations. Parametric models are used to estimate the total cost of cleaning up these sites over future years. The estimates also include a 5-year minimum operational period within the remedial action phase unless Centers indicate the exact number of years if different than 5 years. In addition, a 5-year monitoring period was added to the estimate for ground water, surface water/sediment, and ecological monitoring. This year, the total cost of environmental cleanup is estimated to be $1.1 billion; an unfunded liability has been recorded in the financial statements for that amount. This estimate reflects a reduction of $300 million from 1998 primarily due to the identification of new factual information used in the parametric models. This estimate could be affected in the future by changes from inflation, deflation, technology, or applicable laws and regulations. Therefore, the estimated environmental liability could range from $710.5 million to $1.65 billion because of future changes. The estimate represents an amount that will be spent to remediate currently known sites, subject to availability of appropriated funds. Other responsible parties that may be required to contribute to the remediation funding could share this liability. In fiscal year 1999, NASA was appropriated $40 million for environmental compliance and restoration. Included in the $1.1 billion liability is $22 million for the cleanup of current operations as required by SFFAS No. 6.

NASA is a party in various administrative proceedings, court actions (including tort suits), and claims brought by or against it. In the opinion of management and legal counsel, the ultimate resolution of these proceedings, actions, and claims will not materially affect the financial position or results. A liability of $351,000 was recorded for these matters as of September 30, 1999, which represents management's estimation in accordance with SFFAS No. 5 of the probable amount of damages that will be assessed against NASA. The Treasury Judgment Fund, which was established by Congress to pay court judgments and settlement agreements negotiated by the Justice Department, could be used to fund assessments.

Contingencies, related to proceedings, actions and claims, in which it is possible but not probable that some cost will be incurred, range from zero to $429 million, as of September 30, 1999. This range is the result of NASA's inclusion in several government-wide proceedings, actions, and claims. Because of the high degree of uncertainty surrounding these matters, no accrual for a probable loss contingency has been recorded on the Statement of Financial Position.

An actuarial liability for $57 million was recorded, as of September 30, 1999, for workers' compensation claims related to the Federal Employees' Compensation Act (FECA), which is administered by the U.S. Department of Labor (DOL). FECA provides income and medical cost protection to covered Federal civilian employees injured on the job, employees who have incurred a work-related occupational disease, and beneficiaries of employees whose death is attributable to a job-related injury or occupational disease. The FECA program initially pays valid claims and subsequently seeks reimbursement from the Federal agencies employing the claimants. This liability does not include the estimated future costs for claims incurred but not reported and/or approved as of September 30, 1999. The present value of these estimates at the end of fiscal year 1999 was calculated by the DOL using a discount rate of 5.5 percent for fiscal year 2000 and 2001, 5.55 percent for fiscal year 2002, and 5.6 percent for fiscal year 2003 and thereafter.

NASA has approximately $38 million recorded in accounts payable related to closed appropriations for which there is a contractual commitment to pay. These payables will be funded from appropriations that are available for obligation at the time a billing is processed, in accordance with Public Law 101–510.

Annual, Sick, and Other Leave

Annual leave is accrued as it is earned; the accrual is reduced as leave is taken. Each year, the balance in the accrued annual leave account is adjusted to reflect current pay rates. To the extent current or prior year appropriations are not available to fund annual leave earned but not taken, funding will be obtained from future financing sources. Sick leave and other types of nonvested leave are expensed as taken.

Employee Benefits

Agency employees participate in the Civil Service Retirement System (CSRS), a defined benefit plan, or the Federal Employees Retirement System (FERS), a defined benefit and contribution plan. For CSRS employees, NASA makes contributions of 8.51 percent of pay. For FERS employees, NASA makes contributions of 10.7 percent to the defined benefit plan and contributes 1 percent of pay to the retirement savings plan (contribution plan), and matches employee contributions up to an additional 4 percent of pay. For FERS employees, the Agency also contributes the employer's matching share for Social Security.

SFFAS No. 5, "Accounting for Liabilities of the Federal Government," requires government agencies to report the full cost of employee benefits for the CSRS, the FERS, the Federal Employee Health Benefit (FEHB), and the Federal Employees Group Life Insurance (FEGLI) programs. NASA used the applicable cost factors and imputed financing sources from the Office of Personnel Management (OPM) Financial Management Letter F-99-09 in these financial statements.

Reclassifications

Certain reclassifications have been made to the 1998 financial statement balances to conform to the 1999 presentation.

2. Fund Balance With Treasury:
(In Thousands)

Fund Balances:	Obligated	Unobligated Available	Unobligated Restricted	Total
Appropriated Funds	$ 5,265,238	$ 747,595	$ 102,625	$ 6,115,458
Trust Funds	—	51	676	727
Total	$ 5,265,238	$ 747,646	$ 103,301	$ 6,116,185
Deposit Funds				100,187
Clearing Accounts				(4,670)
Total Fund Balance With Treasury				$ 6,211,702

Obligated balances represent the cumulative amount of obligations incurred, including accounts payable, which are supported by documentary evidence, for which outlays have not yet been made. Unobligated available balances represent the amount remaining in appropriation accounts that are available for obligation in the next fiscal year. Unobligated restricted balances represent the amount remaining in appropriation accounts that can only be used for adjustments to previously recorded obligations. Unobligated restricted trust fund balances represent amounts that must be apportioned by the Office of Management and Budget before being used to incur obligations.

Deposit funds represent advance payments from reimbursable customers that will be transferred to the funding appropriation accounts when the reimbursable order is earned. Clearing accounts are used for unidentified remittances presumed to be applicable to budget accounts but are being held in the clearing account because the specific appropriation account is not yet known.

3. Investments:
(In Thousands)

	Par Value	Amortization Method	Discounts and Premiums, Net	Net Amount Invested
Intragovernmental Non-Marketable Securities	$ 13,442	Interest method	$ 3,288	$ 16,730

Intragovernmental securities are nonmarketable Treasury securities issued by the Bureau of Public Debt.

Interest rates range from 5 percent to 9 percent.

4. Accounts Receivable, Net:
(In Thousands)

	Accounts Receivable	Allowance for Uncollectible Receivables	Net Amount Due
Intragovernmental	$ 127,720	$ —	$ 127,720
Governmental	4,508	(1,121)	3,387
Total	$ 132,228	$ (1,121)	$ 131,107

5. Operating Materials and Supplies:
(In Thousands)

		Valuation Method
Stores Stock	$ 2,253,538	Weighted Average Cost
Standby Stock	2,641	Weighted Average Cost
Total	$ 2,256,179	

Stores stock represents material being held in inventory that is repetitively procured, stored, and issued on the basis of recurring demand. Standby stock represents material held for emergencies. These amounts are held for use in current operations. Excess, obsolete, and unserviceable items have been removed from these amounts.

NASA Centers are responsible for continually reviewing operating materials and supplies on-hand to identify items that are no longer needed for operational purposes or that need to be replaced.

6. Property, Plant, and Equipment:
(In Thousands)

	Cost	Accumulated Depreciation	Net Asset Value
Government-owned/Government-held:			
Land	$ 108,799	$ —	$ 108,799
Structures, Facilities, and Leasehold Improvements	5,133,020	(3,070,906)	2,062,114
Assets in Space	20,352,345	(13,027,849)	7,324,496
Equipment	1,727,611	(935,865)	791,746
Work-in-Process	4,045,224	—	4,045,224
Total	31,366,999	(17,034,620)	14,332,379
Government-owned/Contractor-held:			
Land	10,349	—	10,349
Structures, Facilities, and Leasehold Improvements	734,103	(453,506)	280,597
Equipment	10,483,683	(5,955,700)	4,527,983
Work-in-Process	4,327,499	—	4,327,499
Total	15,555,634	(6,409,206)	9,146,428
Total Property, Plant, and Equipment	$ 46,922,633	$ (23,443,826)	$ 23,478,807

Assets in Space are various spacecraft that operate above the atmosphere for exploration purposes. Equipment includes special tooling, special test equipment, and space hardware, such as the Space Shuttle and other configurations of spacecraft: engines, unlaunched satellites, rockets, and International Space Station and other scientific components unique to NASA space programs. Structures, Facilities, and Leasehold Improvements includes buildings with collateral equipment and capital improvements such as airfields, power distribution systems, flood control, utility systems, roads, and bridges. NASA also has use of certain properties at no cost. These properties include land at the Kennedy Space Center withdrawn from the public domain and land and facilities at the Marshall Space Flight Center under a no-cost, 99-year lease with the U.S. Department of the Army. Work-in-Process is the cost incurred for property, plant, and equipment items not yet completed.

7. Other Liabilities:
(In Thousands)

	Current	Non-Current	Total
Intragovernmental Liabilities:			
Liability for Deposit and Suspense Funds	$ 20,392	$ —	$ 20,392
Accrued Payroll and Benefits	9,288	—	9,288
Accounts Payable for Closed Appropriations	4	2,555	2,559
Workers' Compensation	7,660	7,791	15,451
Liability for Receipt Accounts	717	—	717
Total Intragovernmental	38,061	10,346	48,407
Governmental Liabilities:			
Liability for Deposit and Suspense Funds	75,443	—	75,443
Contract Holdbacks	3,593	—	3,593
Accrued Payroll and Benefits	83,015	—	83,015
Lease Liabilities	637	—	637
Accounts Payable for Closed Appropriations	3,884	31,936	35,820
Unfunded Annual Leave	—	131,362	131,362
Liability for Receipt Accounts	2,727	—	2,727
Total Governmental	169,299	163,298	332,597
Total Other Liabilities	$ 207,360	$ 173,644	$ 381,004

All liabilities covered by budgetary resources are current. Liability for Deposit and Suspense Funds includes cash advances received from other Government agencies and public reimbursable customers. Also included are funds on deposit with the U.S. Department of the Treasury for employees' savings bonds and state tax withholdings.

See **Note 8** for further discussion of liabilities not covered by budgetary resources.

8. Liabilities Not Covered by Budgetary Resources:
(In Thousands)

	Current	Non-Current	Total
Intragovernmental Liabilities:			
Accounts Payable for Closed Appropriations	$ 4	$ 2,555	$ 2,559
Workers' Compensation	7,660	7,791	15,451
Liability for Receipt Accounts	717	—	717
Total Intragovernmental	8,381	10,346	18,727
Governmental Liabilities:			
Accounts Payable for Closed Appropriations	3,884	31,936	35,820
Unfunded Annual Leave	—	131,362	131,362
Liability for Receipt Accounts	2,727	—	2,727
Lease Liabilities	294	—	294
Total Governmental	6,905	163,298	170,203
Total Liabilities Not Covered by Budgetary Resources	$ 15,286	$ 173,644	$ 188,930

See **Note 1** for further discussion of liabilities not covered by budgetary resources.

9. Non-Entity Assets:
(In Thousands)

Asset	Intragovernmental	Due from the Public	Total Non-Entity Assets
Accounts Receivable, Net	$ 135	$ 3,309	$ 3,444

Non-Entity Assets includes deposit accounts for U.S. savings bonds and state tax deductions related to the processing of payroll. Accounts receivable related to closed appropriations, which will be deposited in miscellaneous receipts, are also included in Non-Entity Assets.

10. Leases:
(In Thousands)

Entity as Lessee:
Capital Leases:
Summary of Assets Under Capital Lease:

Equipment	$ 1,356
Accumulated Amortization	(719)
	$ 637

NASA capital leases consist of assorted ADP and copier equipment with noncancelable terms longer than 1 year, a fair market value of $100,000 or more, a useful life of 2 years or more, and agreement terms equivalent to an installment purchase.

Future Lease Payments:	Fiscal Year	
	2000	$ 343
	2001	323
	2002	—
	2003	—
	2004	—
	2005 and after	—
	Future Lease Payments	666
	Less: Imputed Interest	(29)
	Net Capital Lease Liability	$ 637

Liabilities Covered by Budgetary Resources	$ 343
Liabilities Not Covered by Budgetary Resources	294
Total	$ 637

Operating Leases:

NASA's fiscal year 1999 operating leases are for an airplane hangar, warehouse storage, copiers, and land.

Future Lease Payments:	Fiscal Year	
	2000	$ 1,340
	2001	1,896
	2002	1,756
	2003	1,756
	2004	1,756
	2005 and after	558
	Total	$ 9,062

Entity as Lessor:
Operating Leases:

NASA leases and allows use of its land, facilities, and equipment by the public and other Government agencies for a fee.

Future Projected Receipts:	Fiscal Year	
	2000	$ 293
	2001	290
	2002	280
	2003	251
	2004	217
	2005 and after	21
	Total	$ 1,352

11. Unexpended Appropriations:
(In Thousands)

	Appropriated Funds
Unexpended Appropriations:	
Undelivered Orders	$ 2,232,712
Unobligated:	
Available	747,646
Restricted	102,625
Total	$ 3,082,983

12. Change in Unfunded Expenses:
(In Thousands)

Unfunded Expense Transaction Type	Current Fiscal Year Increase (Decrease)
Closed appropriations accounts payable	$ 2,606
Annual leave	(2,059)
Probable contingent liabilities	(67,917)
Environmental cleanup	(294,960)
Workers' Compensation	(790)
Total Current Fiscal Year Unfunded Expenses	$ (363,120)

The change in unfunded expenses represents a decrease, during fiscal year 1999, of the amounts estimated to be paid from future appropriations.

13. Gross Cost and Earned Revenue by Budget Functional Classification:
(In Thousands)

Functional Classification	Gross Cost	Earned Revenue	Net Cost
General Science, Space, and Technology	$ 13,261,246	$ 767,794	$ 12,493,452
Transportation	1,337,184	50,016	1,287,168
Costs Not Assigned to Programs	(2,342,636)	—	(2,342,636)
Trust Funds	832	—	832
Total	$ 12,256,626	$ 817,810	$ 11,438,816

14. Budgetary Resources:
(In Thousands)

	Science, Aeronautics and Technology	Human Space Flight	Mission Support	Other	Total
Budgetary Resources:					
Budget Authority	$ 5,653,900	$ 5,480,000	$ 2,499,739	$ 16,697	$ 13,650,336
Unobligated Balances - Beginning of Period	495,565	284,892	147,409	137,373	1,065,239
Net Transfers of Prior-Year Balances, Actual	—	—	—	—	—
Spending Authority from Offsetting Collections	505,420	169,639	61,716	(28,758)	708,017
Recoveries of Prior-Year Obligations	409,904	98,942	160,000	16,959	685,805
Cancellation of Expired Accounts	—	—	—	(34,668)	(34,668)
Total Budgetary Resources	**$ 7,064,789**	**$ 6,033,473**	**$ 2,868,864**	**$ 107,603**	**$ 16,074,729**
Status of Budgetary Resources:					
Obligations Incurred	$ 6,752,717	$ 5,663,003	$ 2,753,693	$ 40,974	$ 15,210,387
Unobligated Balances - Available	280,575	368,361	85,768	12,942	747,646
Unobligated Balances - Restricted	31,497	2,109	29,403	53,687	116,696
Total Status of Budgetary Resources	**$ 7,064,789**	**$ 6,033,473**	**$ 2,868,864**	**$ 107,603**	**$ 16,074,729**
Outlays:					
Obligations Incurred, Net	$ 6,342,813	$ 5,564,061	$ 2,593,693	$ 24,015	$ 14,524,582
Less: Spending Authority from Offsetting Collections	(505,420)	(169,639)	(61,716)	28,758	(708,017)
Obligations Incurred, Net	**5,837,393**	**5,394,422**	**2,531,977**	**52,773**	**13,816,565**
Obligated Balance, Net - Beginning of Period	2,925,024	1,649,421	449,234	76,630	5,100,309
Less: Obligated Balance, Net - End of Period	(2,977,072)	(1,626,554)	(585,804)	(63,728)	(5,253,158)
Total Outlays	**$ 5,785,345**	**$ 5,417,289**	**$ 2,395,407**	**$ 65,675**	**$ 13,663,716**

Mission Support Budget Authority includes the rescission of $11,361 per Public Law 106–51, the Emergency Steel Loan Guarantee and Emergency Oil and Gas Guaranteed Loan Act of 1999.

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
Heritage Assets
for the Fiscal Year Ended September 30, 1999

Federal agencies are required to classify and report heritage assets, in accordance with the requirements of Statement of Federal Financial Accounting Standards No. 8, "Supplementary Stewardship Reporting." Heritage assets are property, plant, and equipment that possess one or more of the following characteristics: historical or natural significance; cultural, educational, or aesthetic value; or significant architectural characteristics.

Because the cost of heritage assets is not often relevant or determinable, NASA does not attempt to value them or to establish minimum value thresholds for the designation of property, plant, or equipment as heritage assets. The useful lives of heritage assets are not reasonably estimable for depreciation purposes.

Because the most relevant information about heritage assets is their existence, they are reported in terms of physical units, as follows:

	1998	Additions	Withdrawals	1999
Buildings and structures	20	11	(6)	25
Air and space displays and artifacts	103	287	(2)	388
Miscellaneous items	6	1093	0	1,099
Total heritage assets	129	1,391	(8)	1,512

NASA heritage assets are considered collectible, except for its fixed assets. Heritage assets were generally acquired through construction by NASA or its contractors, and they are expected to remain in this category, except where there is legal authority for transfer or sale. NASA's heritage assets are generally in fair condition, suitable only for display.

Many of the buildings and structures are designated as National Historic Landmarks. Numerous air and spacecraft and related components are on display at various locations to enhance public understanding of NASA programs. NASA eliminated their cost from its property records when they were designated as heritage assets. A portion of the amount reported for deferred maintenance is for heritage assets.

For more than 30 years, the NASA Art Program, an important heritage asset, has documented America's major accomplishments in aeronautics and space. During that time, more than 200 artists have generously contributed their time and talent to record their impressions of the U.S. aerospace program in paintings, drawings, and other media. Not only do these art works provide a historic record of NASA projects, they give the public a new and fuller understanding of advancements in aerospace. Artists are in fact given a special view of NASA through the "back door." Some have witnessed astronauts in training or scientists at work. The art collection, as a whole, depicts a wide range of subjects, from Space Shuttle launches to aeronautics research, the Hubble Space Telescope, and even virtual reality.

Artists commissioned by NASA receive a small honorarium in exchange for donating a minimum of one piece to the NASA archive, which now numbers more than 700 works of art. In addition, more than 2,000 works have been donated to the National Air and Space Museum.

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
Stewardship Investments: Research and Development
for the Fiscal Year Ended September 30
(In Thousands)

Program/Application:	1999	1998
Space Station		
Applied Research	$ 99,678	$ 137,529
Development	2,456,172	2,362,996
	2,555,850	2,500,525
Life and Microgravity		
Basic	162,858	221,217
Applied Research	119,548	157,727
Development	14,239	20,365
	296,645	399,309
Payload Utilization and Operations		
Applied Research	375,970	401,528
	375,970	401,528
Space Science		
Basic	757,812	1,049,037
Applied Research	827,405	429,895
Development	992,372	857,453
	2,577,589	2,336,385
Earth Science		
Basic	358,782	331,095
Applied Research	130,625	156,835
Development	1,252,260	1,254,677
	1,741,667	1,742,607
Aeronautics Research and Technology		
Basic	356,546	438,923
Applied Research	910,027	937,011
Development	20,595	—
	1,287,168	1,375,934
Space Access and Technology		
Applied Research	569,775	678,036
	569,775	678,036
Commercial Programs		
Basic	99,080	—
Applied Research	45,341	98,198
Development	23,510	45,788
	167,931	143,986
Mission Communication Services		
Development	430,503	444,933
	430,503	444,933
Academic Programs		
Basic	93,339	90,468
Applied Research	19,657	19,481
Development	13,823	37,634
	126,819	147,583
Total Research and Development Expenses by Program	**$ 10,129,917**	**$ 10,170,826**

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
Stewardship Investments: Research and Development
for the Fiscal Year Ended September 30
(In Thousands)

Program/Application (continued):	1999	1998
Non-Research and Development Expenses by Program		
Space Shuttle	$ 3,285,407	$ 3,369,846
Space Communication Services	184,978	254,440
U.S./Russian Cooperative	151,396	152,625
Other Programs	28,922	218,109
Trust Funds	832	1,457
Reimbursable Expenses	817,810	715,407
Total Non-Research and Development Expenses by Program	**$ 4,469,345**	**$ 4,711,884**
Total Program Expenses	**$ 14,599,262**	**$ 14,882,710**

NASA makes substantial research and development investments for the benefit of the Nation. These amounts are expensed as incurred in determining the net cost of operations.

NASA's research and development programs include activities to extend our knowledge of Earth, its space environment, and the universe and to invest in new aeronautics and advanced space transportation technologies that support the development and application of technologies critical to the economic, scientific, and technical competitiveness of the United States.

National Aeronautics and Space Administration
Required Supplementary Information
Deferred Maintenance
for the Fiscal Year Ended September 30, 1999

NASA has deferred maintenance only on its facilities, including structures. There is no significant deferred maintenance on other physical property, such as land, equipment, assets in space, work-in-process, leasehold improvements, and assets under capital lease. Contractor-held property is subject to the same considerations.

The condition assessment survey method is used for facilities to determine asset condition and maintenance required. Several methods are used for evaluating facility condition: (1) 100 percent inspection and condition assessment on a 5-year cycle; (2) metrics to support long-term trend analyses; and (3) application of industry standards. Furthermore, in 1997, NASA conducted a NASA-wide Facility Investment Study to identify future repairs and maintenance activities throughout the Agency. Acceptable operating condition is in accordance with standards comparable to those used in private industry, including the aerospace industry.

There have been no changes to Agency condition assessment procedures in the past several years. NASA's estimate of its backlog of maintenance and repair is approximately $1.26 billion. This estimate was derived from the 1997 NASA-wide Facility Investment Study and was adjusted as of September 30, 1999, to reflect inflation and the amounts budgeted to correct existing facility deficiencies.

Deferred maintenance related to heritage assets is included in the deferred maintenance for general facilities. Maintenance is not deferred on assets that require immediate repair to restore them to safe working condition and have an Office of Safety and Mission Assurance Risk Assessment Classification Code 1 (see NASA STD 8719.7).

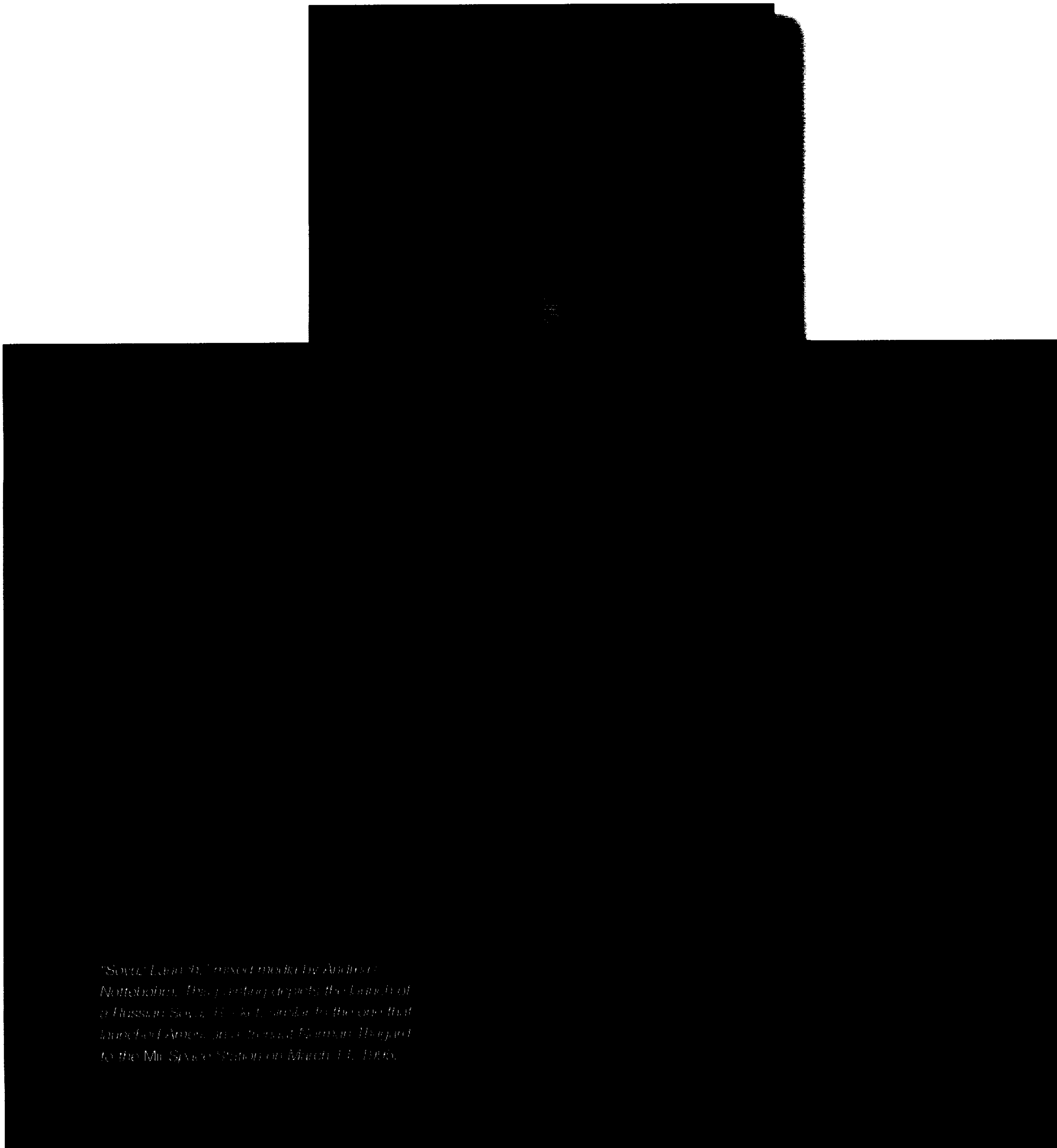
National Aeronautics and Space Administration
Required Supplementary Information
as of September 30, 1999
(In Thousands)

Intragovernmental Assets:

Agency	Fund Balance with Treasury	Accounts Receivable	Investments	Advances and Prepaid Expenses
Treasury	$ 6,211,702	$ 45	$ 16,730	$ —
Air Force	—	20,263	—	80
Army	—	13,616	—	—
Commerce	—	38,246	—	1,131
Navy	—	12,280	—	14,155
Secretary of Defense	—	34,990	—	120
Other	—	8,280	—	74
Total Intragovernmental Assets	**$ 6,211,702**	**$ 127,720**	**$ 16,730**	**$ 15,560**

Intragovernmental Liabilities:

Agency	Accounts Payable	Closed Accounts Payable	Workers' Compensation	Liability for Deposit and Suspense Funds and Other Liabilities
Air Force	$ 81,130	$ 1,470	$ —	$ 11,660
Army	14,402	1	—	496
Commerce	14,636	313	—	2,174
Energy	15,518	8	—	37
Labor	15	—	15,451	—
Navy	17,185	455	—	599
Office of Personnel Management	—	—	—	9,288
Secretary of Defense	10,636	262	—	4,219
Transportation	2,518	—	—	1,113
Other	16,104	50	—	811
Total Intragovernmental Liabilities	**$ 172,144**	**$ 2,559**	**$ 15,451**	**$ 30,397**



"Soyuz Launch," mixed media by Andreas Nottebohm. This painting depicts the launch of a Russian Soyuz Rocket similar to the one that launched American astronaut Norman Thagard to the Mir Space Station on March 14, 1995.

AUDITORS' REPORTS

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

Reply to Attn of: W

FEB 17 2000

TO: A/Administrator
B/Chief Financial Officer

FROM: W/Inspector General

SUBJECT: Audit of the National Aeronautics and Space Administration's Fiscal Year 1999 Financial Statements

We contracted with Arthur Andersen LLP, an independent certified public accounting firm, to audit the NASA Fiscal Year 1999 Financial Statements. The contract required that the audit be done in accordance with government auditing standards and with Office of Management and Budget Bulletin 98-08, as amended, "Audit Requirements for Federal Financial Statements."

In its audit report dated February 2, 2000, Arthur Andersen issued an unqualified opinion on NASA's financial statements. Additionally, Arthur Andersen found no material weaknesses* in internal controls, and no reportable conditions related to internal controls and compliance with the laws and regulations it tested.

To ensure the quality of the audit work performed, we monitored the progress of the audit at key points and reviewed Arthur Andersen's report and related working papers to ensure compliance with applicable standards. Our review, as differentiated from an audit in accordance with generally accepted government auditing standards, was not intended to enable us to express, and we do not express, opinions on NASA's financial statements or on conclusions about the effectiveness of internal controls or conclusions on compliance with laws and regulations. Arthur Andersen is responsible for the attached auditor's report (see Enclosure) and for the conclusions expressed in the report. However, our review showed that Arthur Andersen complied, in all material respects, with applicable standards and mandated requirements.

Please contact me or Mr. Russell A. Rau, Assistant Inspector General for Auditing, at 358-1232, if you have any questions concerning our review.

Roberta L. Gross

Enclosure

---

* A material weakness is a reportable condition in which the design or operation of one or more of the internal control structure elements does not reduce to a relatively low level the risk that errors or irregularities in amounts that would be material in relation to the financial statements being audited may occur and not be detected within a timely period by employees in the normal course of performing their assigned functions.

Report of Independent Public Accountants on Financial Statements

To the Inspector General of the
National Aeronautics and Space Administration:

We have audited the accompanying Statement of Financial Position of the National Aeronautics and Space Administration (NASA) as of September 30, 1999 and 1998, the related Statement of Budgetary Resources for the years then ended, and the related Statements of Net Cost, Changes in Net Position, and Financing for the year ended September 30, 1999. These financial statements are the responsibility of NASA's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards, the standards applicable to financial audits contained in *Government Auditing Standards* (1994 Revision), issued by the Comptroller General of the United States, and Office of Management and Budget (OMB) Bulletin No. 98-08, "Audit Requirements for Federal Financial Statements," as amended. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of NASA as of September 30, 1999 and 1998, its budgetary resources for the years then ended, and its net cost, changes in net position, and financing for the year ended September 30, 1999, in conformity with generally accepted accounting principles.

The Required Supplementary Information and Required Supplementary Stewardship Information are not a required part of the basic financial statements but are supplementary information required by OMB Bulletin No. 97-01, "Form and Content of Agency Financial Statements," as amended. We have applied certain limited procedures that consisted principally of inquiries of management regarding the methods of measurement and presentation of the supplementary information. However, we did not audit the information and express no opinion on it.

We have also issued separate reports dated February 2, 2000, on NASA's internal control and on its compliance with laws and regulations.

Arthur Andersen LLP

Vienna, Virginia
February 2, 2000

ARTHURANDERSEN

Report of Independent Public Accountants on Internal Control

To the Inspector General of the
National Aeronautics and Space Administration:

We have audited the Statement of Financial Position of the National Aeronautics and Space Administration (NASA) as of September 30, 1999 and 1998, the related Statement of Budgetary Resources for the years then ended, and the related Statements of Net Cost, Changes in Net Position, and Financing for the year ended September 30, 1999, and have issued our report thereon dated February 2, 2000. We conducted our audits in accordance with generally accepted auditing standards, the standards applicable to financial audits contained in *Government Auditing Standards* (1994 Revision), issued by the Comptroller General of the United States, and Office of Management and Budget (OMB) Bulletin No. 98-08, "Audit Requirements for Federal Financial Statements," as amended. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement.

In planning and performing our audit of the financial statements of NASA for the year ended September 30, 1999, we obtained an understanding of NASA's internal control over financial reporting. With respect to the internal control over financial reporting, we obtained an understanding of the design of relevant policies and procedures and whether they have been placed in operation, and we assessed control risk and performed tests of controls in order to determine our auditing procedures for the purpose of expressing our opinion on the financial statements and not to provide assurance on the internal control over financial reporting. Accordingly, we do not express such an opinion on the internal control over financial reporting.

Our consideration of the internal control over financial reporting would not necessarily disclose all matters in the internal control over financial reporting that might be reportable conditions. Under standards issued by the American Institute of Certified Public Accountants, reportable conditions are matters coming to our attention relating to significant deficiencies in the design or operation of the internal control that, in our judgment, could adversely affect NASA's ability to record, process, summarize, and report financial data consistent with the assertions by management in the financial statements. A material weakness is a condition in which the design or operation of one or more of the internal control components does not reduce to a relatively low level the risk that misstatements in amounts that would be material in relation to the financial statements being audited may occur and not be detected within a timely period by employees in the normal course of performing their assigned functions. We noted no matters involving the internal control over financial reporting and its operation that we consider to be reportable conditions or material weaknesses. However, we noted certain matters involving the internal control over financial reporting and its operation that we have reported to the Inspector General and the Administrator of NASA in a separate letter dated February 2, 2000. We noted in that letter that NASA has made considerable progress in correcting the majority of the information technology security policy and procedural findings associated with its financial management systems as identified in our report on internal control over financial reporting dated February 3, 1999. Certain policies and procedures related to the security of NASA's financial management systems continue to require improvement.

In addition, we considered NASA's internal control over Required Supplementary Information and Required Supplementary Stewardship Information by obtaining an understanding of NASA's internal controls, determining whether those internal controls had been placed in operation, assessing control risk and performing tests of controls as required by OMB Bulletin No. 98-08, as amended. Our procedures were not designed to provide assurance on these internal controls. Accordingly, we do not express such an opinion on the internal control over Required Supplementary Information and Required Supplementary Stewardship Information.

ARTHUR ANDERSEN

Lastly, with respect to internal controls related to performance measures reported in the fiscal year 1999 Accountability Report, we obtained an understanding of the design of significant internal controls related to the existence and completeness assertions, as required by OMB Bulletin No. 98-08, as amended. Our procedures were not designed to provide assurance on the internal control over reported performance measures, and, accordingly, we do not express such an opinion on the internal control related to performance measures.

This report is intended solely for the information and use of the Inspector General, the Administrator and management of NASA, OMB and Congress, and is not intended to be and should not be used by anyone other than these specified parties.

Vienna, Virginia
February 2, 2000

Arthur Andersen LLP

ARTHURANDERSEN

Report of Independent Public Accountants
on Compliance with Laws and Regulations

To the Inspector General of the
National Aeronautics and Space Administration:

We have audited the Statement of Financial Position of the National Aeronautics and Space Administration (NASA) as of September 30, 1999 and 1998, the related Statement of Budgetary Resources for the years then ended, and the related Statements of Net Cost, Changes in Net Position, and Financing for the year ended September 30, 1999, and have issued our report thereon dated February 2, 2000. We conducted our audits in accordance with generally accepted auditing standards, the standards for financial audits contained in *Government Auditing Standards* (1994 Revision), issued by the Comptroller General of the United States, and Office of Management and Budget (OMB) Bulletin No. 98-08, "Audit Requirements for Federal Financial Statements," as amended. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement.

Compliance with laws and regulations applicable to NASA is the responsibility of NASA's management. As part of obtaining reasonable assurance about whether the statements referred to above are free of material misstatement, we performed tests of NASA's compliance with provisions of certain laws and regulations, noncompliance with which could have a direct and material effect on the determination of financial statement amounts, and certain other laws and regulations specified in OMB Bulletin No. 98-08, as amended, including the requirements referred to in the Federal Financial Management Improvement Act (FFMIA) of 1996.

Under FFMIA, we are required to report whether NASA's financial management systems substantially comply with 1) Federal financial management systems requirements, 2) applicable Federal accounting standards and 3) the requirement to record transactions consistent with the United States Government Standard General Ledger at the transaction level. To meet this requirement, we performed tests of compliance using the implementation guidance for FFMIA included in Appendix D of OMB Bulletin No. 98-08, as amended.

The results of our tests disclosed no instances of noncompliance that are required to be reported herein under *Government Auditing Standards* or OMB Bulletin No. 98-08, as amended. Additionally, the results of our tests disclosed no instances in which NASA's financial management systems did not substantially comply with the three requirements of FFMIA described in the preceding paragraph. Furthermore, NASA asserts, based on an opinion from its General Counsel, that it is in compliance with appropriation statutes. The status of current discussions with the Office of the Inspector General related to compliance with certain appropriation statutes is discussed further in the Compliance with Legal and Regulatory Financial Requirements section of NASA's fiscal year 1999 Accountability Report. The objective of our audit of the financial statements was not to provide an opinion on compliance with provisions of certain laws and regulations. Accordingly, we do not express such an opinion.

Additionally, the objective of our audit of the financial statements was not to determine whether NASA's systems are Year 2000 compliant. NASA management is solely responsible for Year 2000 compliance for its systems and any other systems that impact NASA's operations, such as those of NASA's vendors, service providers or other third parties. Accordingly, we have no responsibility to determine, and provide no assurance on, whether NASA has addressed or will be able to address the affected systems on a timely basis.

This report is intended solely for the information and use of the Inspector General, the Administrator and management of NASA, OMB and Congress, and is not intended to be and should not be used by anyone other than these specified parties.

Vienna, Virginia
February 2, 2000

Arthur Andersen LLP

"Visions of Space," acrylic painting by Bill Shields. The artist's interpretation of the combined effort of astronauts, space shuttles, and humankind's scientific knowledge opens up new vistas in space.

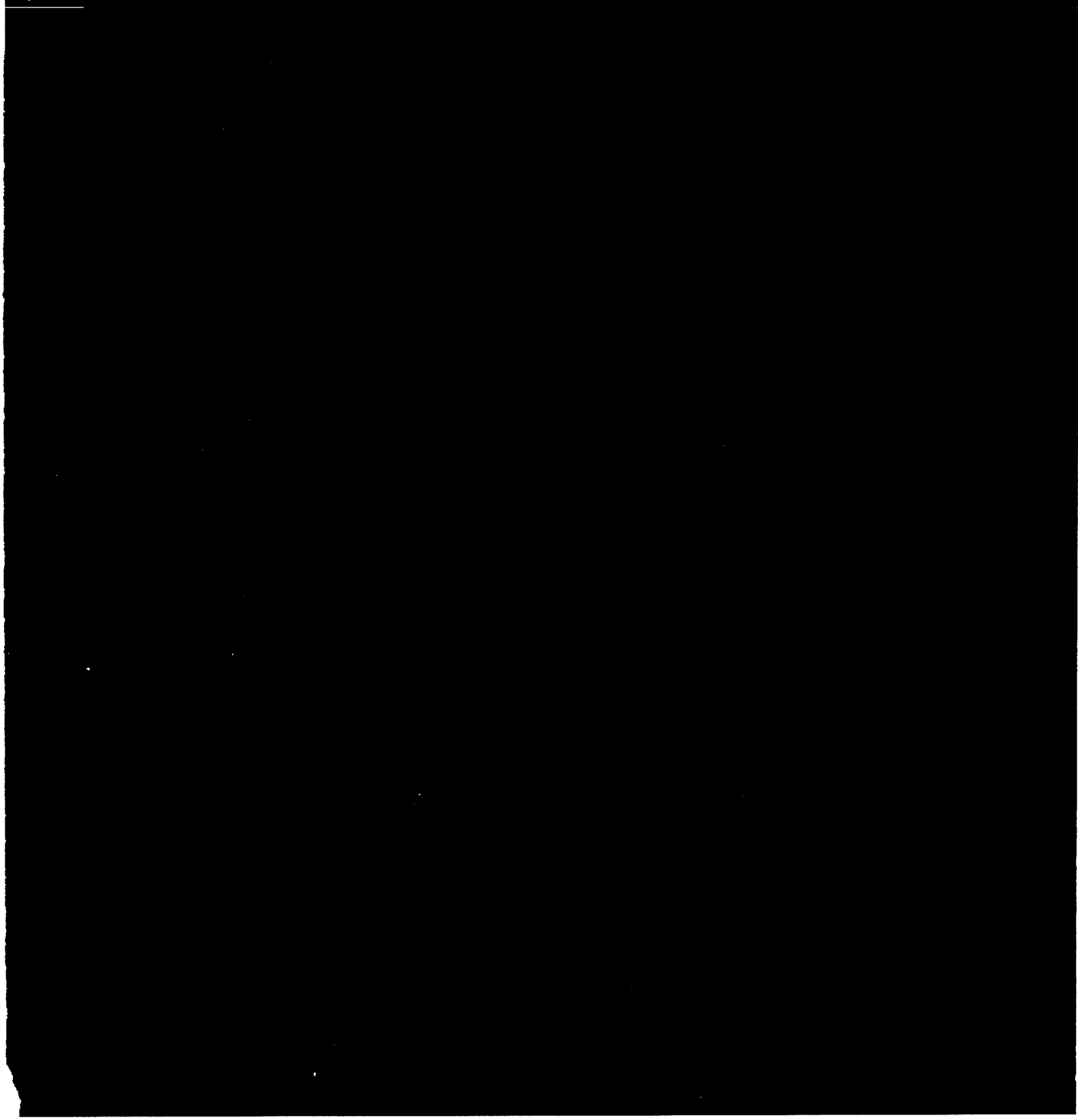
List of Acronyms

3-D	Three-dimensional
A	
AACB	Aeronautics and Astronautics Coordinating Board
ADP	Automated Data Processing
AGA	Association of Government Accountants
AGATE	Advanced General Aviation Transport Experiment
ALR	Audit Liaison Representative
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AVOSS	Aircraft Vortex Spacing System
C	
CDR	Critical Design Review
CD-ROM	Compact Disk-Read Only Memory
CERES	Clouds and the Earth's Radiant Energy System
CFIT	Controlled Flight Into Terrain
CFO	Chief Financial Officer
CIO	Chief Information Officer
CLF	Civilian Labor Force
CNMOS	Consolidated Network Mission Operations Support
CSOC	Consolidated Space Operations Contract
CSRS	Civil Service Retirement System
CXO	Chandra X-ray Observatory
D	
DA	Data Analysis
DAAC	Distributed Active Archive Center
DCAA	Defense Contract Audit Agency
DFRC	Dryden Flight Research Center
DOD	(U.S.) Department of Defense
DOL	(U.S.) Department of Labor
E	
EOS IDS	Earth Observing System Interdisciplinary Science Investigation
EPA	Environmental Protection Agency
ERAST	Experimental Research Aircraft Sensor Technology
ESE	Earth Science Enterprise
ESARP	Earth Science Applications Research Program
ESIP	Earth Science Information Partner
EVA	Extravehicular Activity
F	
FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulation
FASAB	Federal Accounting Standards Advisory Board
FECA	Federal Employees Compensation Act
FEDCIRC	Federal Computer Incident Response Capability
FEGLI	Federal Employee Group Life Insurance
FEHB	Federal Employee Health Benefit
FEMA	Federal Emergency Management Agency
FERS	Federal Employees Retirement System
FFMIA	Federal Financial Management Improvement Act
FMFIA	Federal Managers' Financial Integrity Act
FTE	Full Time Equivalent
FTS	Flight Termination Systems
FY	Fiscal Year
G	
GAAP	Generally accepted accounting principles
GAO	General Accounting Office
GLOBE	Global Learning and Observations to Benefit the Environment
GPS	Global Positioning System

H	
HEDS	Human Exploration and Development of Space
HPCC	High Performance Computing and Communications
HTS	High-Temperature Superconducting
I	
ICM	Interim Control Module
IFMS	Integrated Financial Management System
ISO	International Organization for Standardization
ISS	International Space Station
IT	Information Technology
ITS	Information Technology Security
J	
JPL	Jet Propulsion Laboratory
K	
K-12	Kindergarten-12th grade
M	
MC	Mission-critical
MEIT	Multi-Element Integration Testing
MISR	Multi-Angle Imaging Spectroradiometer
MIT	Massachusetts Institute of Technology
MODIS	Moderate Resolution Imaging Spectroradiometer
MOLA	Mars Orbiter Laser Altimeter
MOS	Modular Optoelectronic Scanner
MOU	Memorandum of Understanding
N	
NACA	National Advisory Committee for Aeronautics
NACC	NASA ADP Consolidation Center
NAIS	NASA Acquisition Internet Service
NASA	National Aeronautics and Space Administration
NASIRC	NASA Automated Systems Incident Response Capability
NAVO	Naval Oceanographic Office
NF	NASA Form
NISN	NASA Integrated Services Network
NMC	Non-mission-critical
NOA	New Obligational Authority
NO_X	Nitrogen oxide
NPD	NASA Policy Directive
NPG	NASA Procedures and Guidance
NSIPP	NASA Seasonal to Inter-annual Prediction Project
NSTISSC	National Security Telecommunications and Information Systems Security Committee
NTTC	National Technology Transfer Center
O	
ODIN	Outsourcing Desktop Initiative for NASA
OIG	Office of Inspector General
OLMSA	Office of Life and Microgravity Sciences and Applications
OMB	Office of Management and Budget
OPM	Office of Personnel Management
ORB	Other Retirement Benefits
P	
PBC	Performance-Based Contracting
PKI	Public Key Infrastructure
PMDP-ALO	Program Management Development Process Accelerating Leadership Option
ProSEDS	Propulsive Small Expendable Deployer System
Q	
QuikSCAT	Quik Scatterometer

R	
R&A	Research and Analysis
R&D	Research and Development
RBAM	Risk-Based Acquisition Management
RBCC	Rocket Based Combined Cycle
RESAC	Regional Earth Science Applications Center
RPA	Remotely Piloted Aircraft
S	
SAGE	Stratospheric Aerosol and Gas Experiment
SAR	Synthetic Aperture Radar
SeaWIFS	Sea-viewing Wide Field-of-view Sensor
SFFAS	Statements of Federal Financial Accounting Standards
SIMBIOS	Sensor Intercomparison and Merger for Biological and Interdisciplinary Ocean Studies
SF	Standard Form
SRTM	Shuttle Radar Topography Mission
SSE	Space Science Enterprise
SSFL	Santa Susana Field Laboratory
SSM/I	Special Sensor Microwave/Imager
STO	Space Team Online
STS	Space Transportation System
T	
TOMS	Total Ozone Mapping Spectrometer
TOPEX	Ocean Topography Experiment
TRMM	Tropical Rainfall Measuring Mission
U	
U.S.	United States
USC	United States Code
USGS	U.S. Geological Survey
USDA	U.S. Department of Agriculture
V	
VPO	Virtual Procurement Office
Y	
Y2K	Year 2000

Notes



National Aeronautics
and Space Administration